

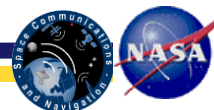


SN Ground Segment Sustainment Project



SGSS Customer Technical Interchange Meeting

March 19, 2015





Welcome



Customer TIM Purposes



- **The SGSS Project highly values the customers it will serve. This TIM is an opportunity to share information, receive feedback and engage in candid conversation**
- **SGSS is committed to keeping the end user community informed about the SGSS progress, system capabilities, interfaces, test opportunities, and transition strategies**
- **This TIM has the following goals:**
 - Update selected information provided at the last TIM
 - Inform customers of key SGSS status, milestones, events, and important dates
 - Convey high level details of the customer interfaces
 - Convey a general concept of the approach for early testing



SGSS TIM and Newsletters Website



- **Customer TIM presentations and newsletters are available on the SGSS website:**

<http://esc.gsfc.nasa.gov/space-communications/sgss.html>





Recap - 3rd Customer TIM – November 2013



- **The 3rd Customer TIM was held in the Fall of 2013 and included the following topics:**
 - System Verification and Validation Testing
 - Scheduling Phases
 - Customer Interfaces
 - Scheduling and Data Interfaces
 - Customer Testing
 - Pre-Deployment
 - Pre-Transition
 - NISN/SMLA Transition



Agenda



- **SGSS Management Overview (T. Gitlin)**
- **SGSS Technical Overview (V. Thanvi)**
- **Interface Overview (V. Thanvi)**
- **Scheduling Interfaces (J.P. Chamoun)**
- **Data Transport Interfaces (W. Eddy)**
- **Early Testing (N. Loomis)**
- **Deployment and Transition Updates (R. Von Wolff)**
- **Wrap-Up**



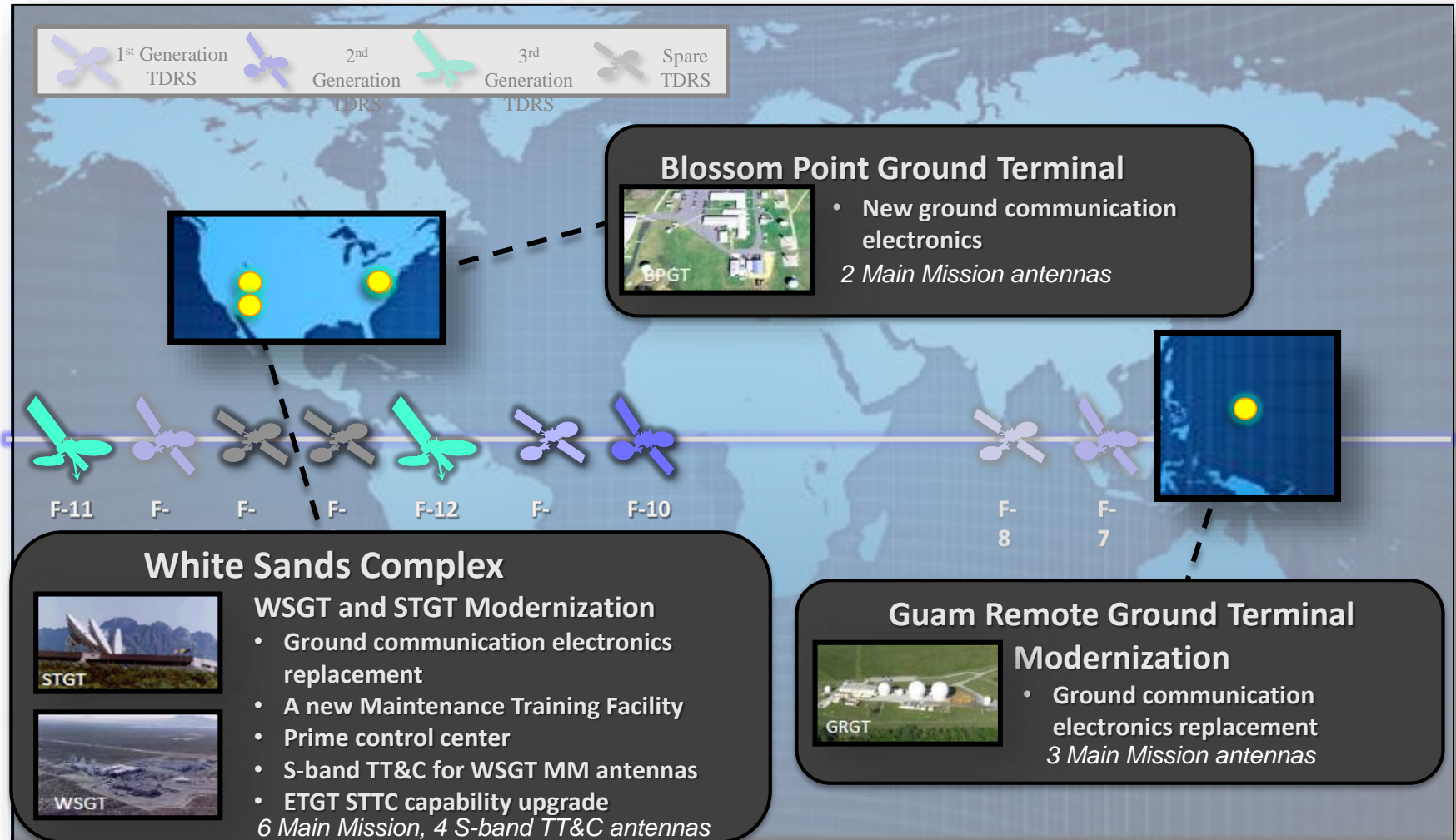
SGSS Background



- **The SGSS Project will develop and deliver a new ground system that will enable the Space Network (SN) to continue safe, reliable, and cost efficient operations for the next several decades**
 - The SN, a designated national resource, provides essential communications and tracking services to NASA human exploration & scientific missions and non-NASA missions
 - The current SN ground segment, developed in the mid 1990s, is based on obsolete technologies and is becoming increasingly difficult to operate safely and reliably
 - The SN space segment is being replenished with additional TDRS spacecraft. TDRS-L was launched on January 23, 2014 and TDRS-M launch is planned for Late 2017
- **SGSS will allow the SN to support an evolving customer set by:**
 - Providing all of the capabilities and capacities required by current SN customer missions
 - Expanding the capabilities and capacities of the SN to support new services for new customers in the near to mid term
 - Delivering an extensible and expandable system to easily allow future modifications to implement services not yet defined
 - Enabling reductions in operations and maintenance costs



SGSS Activities Across Diverse Geographies





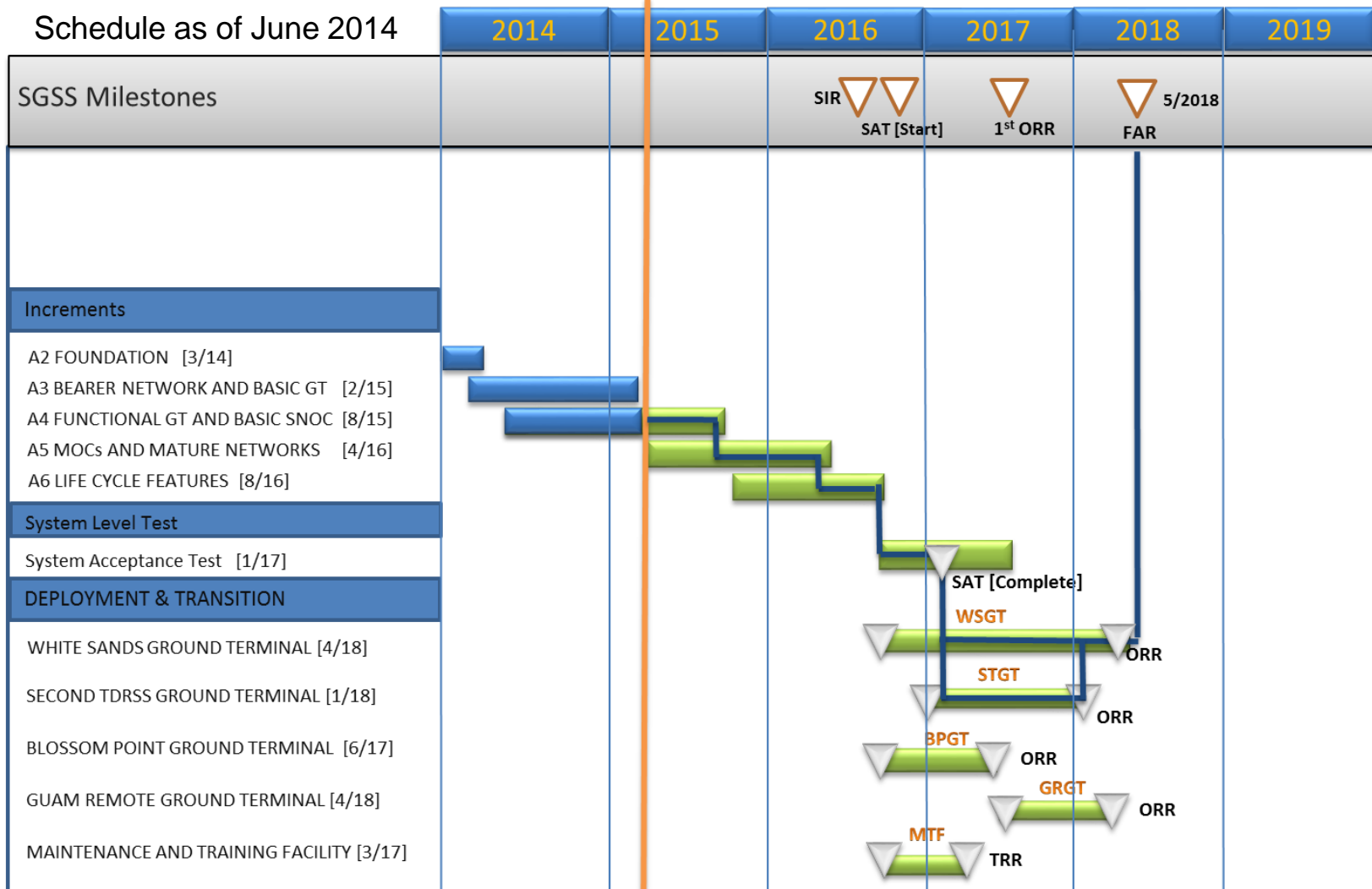
Current Project Status / Near-term Plan



- **GD submitted an Over-Target Baseline Proposal in June 2014; this triggered the need to propose submission of a revised Agency Baseline Commitment for the SGSS Project.**
- **SGSS Project and the SCan Program conducted a series of reviews and presentations leading to a briefing to the Associate Administrator (AA) / Agency Program Management Council (APMC) in November 2014.**
- **Received authorization from the AA to continue implementing to the proposed re-plan through June 2015 at which point SGSS/SCaN must present its proposed Re-Baseline Review to the AA / APMC, including a new Joint Confidence Level (JCL) assessment.**
 - GD will include detailed work package planning through at least the Initial Capability Operational Readiness Review (ORR) in its next Rolling Wave submission (due April 2015)
 - Series of SGSS Project Reviews in May / June, culminating in Re-Baseline Review with the AA / APMC.



Top Level Schedule





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SGSS Functional Architecture



Maintenance & Training (MT)

- Offline support for the SGSS
- System/SW maintenance, debug
- System-wide training access

The MT element is not part of the operational system.

Digital Signal Processing (DSP)

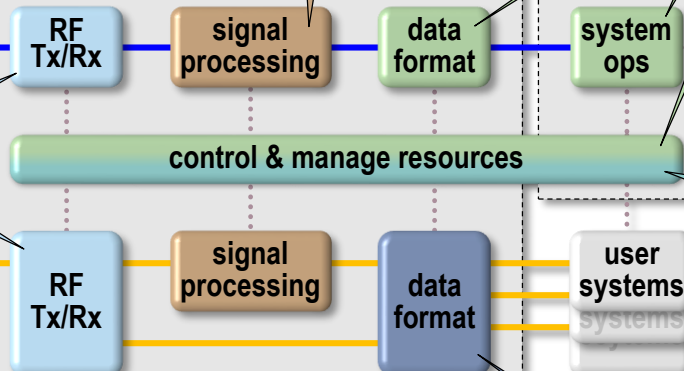
- Convert analog <> digital signal
- Modulates, demodulates, encodes, decodes traffic
- Ground-based beam-forming
- High-Speed IF signal distribution

Fleet & Ground Mgmt (FGM)

- Control and manage the TDRS fleet
- Manage the ground resources
- Manage the entire SGSS enterprise

Space-Ground Link (SGL)

- Forms the link between the antenna feed and the signal processing equipment
- Provide precise timing and frequency references



These element color codes are consistently used throughout our system documentation

Service Management (SM)

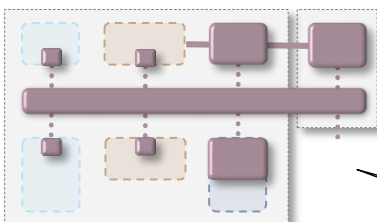
- Plan, schedule, and execute user service sessions
- Monitor and report user service performance

Enterprise Infrastructure (EI)

- High-availability operating environment to host applications system-wide
- Catalog of common *services*
- Internal system networking resources
- Network/boundary protection
- CMD and TLM encryption/decryption

User Services Gateway (USG)

- External interfaces for forward and return user traffic
- Data format, protocol translation
- Signal/baseband record and replay



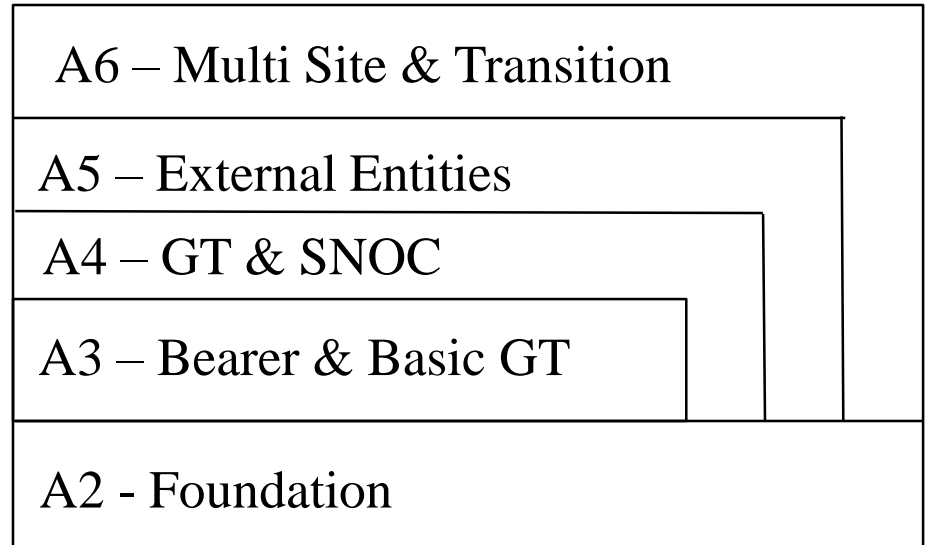
EI provides processing and networking, supporting and connecting the other elements



Incremental System Build-Up



- **SGSS System is built up in 6 increments.**
- **The approach is to incrementally build the system in a manner that a set of key system functionalities are demonstrated at the completion of each increment**
- **Each new increment will build upon functionality demonstrated in prior increments.**





SGSS Incremental Integration Objectives



	A2 Foundation L3/L4 complete: 6/27/14	A3 Bearer Network and Basic GT L4 complete: 2/27/15	A4 Functional GT and Basic SNOC L4 complete: 8/31/15	A5* MOCs and Mature Networks	A6* Life Cycle Features
Overall Theme	<ul style="list-style-type: none"> Element integration on EI Selective Element Integration Core functionality integration 	<ul style="list-style-type: none"> Isolated GT with limited service execution Core Bearer Integration Limited Local Services 	<ul style="list-style-type: none"> GT + SNOC, all local User data relay services execution exc. Dig IF Additional Local Services 	<ul style="list-style-type: none"> External Network Integration SNOC Functional Completion User MOC Services Initial Ctrl Plane Legacy Adapters Test Services 	<ul style="list-style-type: none"> Multisite Services and Transition Support Feature Completion Remaining Legacy Adapters Automation
Bearer Plane	<ul style="list-style-type: none"> Initial RF/IF Integration 	<ul style="list-style-type: none"> RF/IF Integration (all antenna exc. Ka & STTC) Bitstream for User & Test MACE Ku Services Recording 	<ul style="list-style-type: none"> User Bearer Block/Frame and Test MA, SSA, Ka Services Tuned Analog IF Bearer Coherency PLOP, ASCs 2NT Forward Combining 	<ul style="list-style-type: none"> Ka EET STTC RF/IF int. Bearer-User MOC Service Integration 2NT Info Service Digital IF IFL 	
Control Plane	<ul style="list-style-type: none"> Initial Gen 1 T&C Transport 	<ul style="list-style-type: none"> Tracking Data Gen 1,2,3 T&C services w/o TDRS ant. control Integrated Service Execution, MMA Signal, T&C and Ku User 	<ul style="list-style-type: none"> BRTS Tracking Integrated Service Execution, User Info Services 	<ul style="list-style-type: none"> User Tracking Services Integrated Service Execution, Test, User Tracking, Some User MOC Services Initial Service Recovery Gen 1,2,3 TDRS ant. control 	<ul style="list-style-type: none"> Integrated Service Execution, Intersite and User MOC Services Service Recovery TDRS Operations complete
Management Plane	<ul style="list-style-type: none"> Fault Mgmt (FM) and Config Mgmt (CM) integration as test tools. 	<ul style="list-style-type: none"> FM, CM (SNOC/GT), Log Mgt deployment FM, CM. Log integration with MEs. Initial mgmt of Sched Resources 	<ul style="list-style-type: none"> P&S initial int. with Sched Engine and Sched Exe. Add'l FM, CM. Log integration with MEs. Add'l FGM and SM mgmt functions of Sched Resources 	<ul style="list-style-type: none"> P&S, Sched Exe supporting E06 interfaces Add'l FM, CM. Log, SIEM, Key integration with MEs Sched Resources mgmt functions complete 	<ul style="list-style-type: none"> Final ME integration MTF-Operational system integration
External Interfaces		<ul style="list-style-type: none"> E02 physical thru transport layers only E04 MACE and 650 IF E05 bitstreams E18 GPS Legacy to WSC 	<ul style="list-style-type: none"> E02 Full for gen 3 E04 except Dig IF E05 frame/block E19 partial 	<ul style="list-style-type: none"> E01 – E05, E24 Full E06, E19 partial E07, E08, E10 (NEN, ATF, DSN) E15 (operational only, no MT) E24 full 	<ul style="list-style-type: none"> Full functionality all interfaces



User Services in the SGSS Management, Control and Bearer Planes



Example Functions/Behaviors

Management	Control	Bearer
<ul style="list-style-type: none">•Service plan and schedule•Situational Awareness•Device (ME) Commissioning•Ground fault mgmt/correlation•Performance trending•SW patch deployment	<ul style="list-style-type: none">•Service initiation•Service recovery•Fleet commanding•Fleet Telemetry processing•Tracking message generation	<ul style="list-style-type: none">•Signal ADC, DAC•Signal tuning, filtering•Signal frequency conversion•Beam forming•Modulation/demodulation•Protocol translation•Format conversion at edge

Example Information

Management	Control	Bearer
<ul style="list-style-type: none">•Ground entity status•Aggregated schedule•Configuration data•System SW/FW•Performance data•Entity Fault data	<ul style="list-style-type: none">•Service control directives•Service status•Fleet commands•Fleet telemetry•Tracking data•Autotrack measurements	<ul style="list-style-type: none">•End-user traffic



SGSS Elements and Capabilities



- **Defined and iterated the buildable element structure to implement behavior**
 - Directly building behavior is seldom advisable or efficient
- **To assure accommodation of system capabilities, ~250 functional threads have been developed**
 - Define multi-element coordinated behaviors
 - Derive element-level functional requirements and interfaces
- **Focused analyses derived related non-functional requirements**
 - Performance allocations
 - Security

System Capabilities (behavior)	System Elements (structure)						
	SGL	DSP	USG	SM	FGM	EI	MT
	Network Management (NM)	○	○	○	○	◆	○
	Fleet Management and Control (FMC)	○	□	□	◆	□	
	Planning and Scheduling (PS)			◆	○	○	
	Real-Time Service Execution (RTE)	◆	◆	◆	□	◆	
	Tracking Services (TS)	□	□	◆	□	○	
	Maintenance, Training, & Development (MTD)	○	○	○	○	○	◆
	System Measurement & Test (SMT)	○	○	◆	○	○	
	System Security	○	○	○	○	◆	◆
	Reliability, Maintainability, Availability (RMA)	□	□	□	◆	□	
	Deployment & Transition (DT)			◆	◆		

◆ Primary □ Contributing ○ Supporting



System Functions in Increments



	A2 L3/L4 finish: 6/27/14	A3 L4 finish: 2/27/15	A4 L4 finish: 8/31/15	A5*	A6*
User Services	<ul style="list-style-type: none"> Basic bearer Ku and S band Non-Digitized Analog 	<ul style="list-style-type: none"> Initial KuSA services All bitstream modes Digital BB, RS-422, ECL MACE 	<ul style="list-style-type: none"> SSA and MA services All bearer block/frame modes and coherency MA beamforming Tuned Analog IF 	<ul style="list-style-type: none"> User MOC encapsulations Legacy user services support (SNUG) NISN Digital IF Inter-facility link Record / Playback Services 	<ul style="list-style-type: none"> Complete Services
Telemetry & Command	<ul style="list-style-type: none"> Basic Gen1 T&C service through DSP 	<ul style="list-style-type: none"> Gen 1,2,3 T&C services w/o TDRS ant. control SGSS T&C info / signaling services for legacy T&C data Command Echo via TLM¹ TDRS vectors for ground antenna angles TDRS encryption bypass 	<ul style="list-style-type: none"> KSA Auto track Gen 2, 3 Intra-site S<->K Handovers User vectors for TDRS antenna angles Fleet View trending & analysis Ground Command Echo¹ 	<ul style="list-style-type: none"> KSA Auto track Gen 1 Complete Flight Dynamics Execute T&C schedule at SNOG External NEN (SLE only), DSN T&C Gen 1,2,3 TDRS ant. Control 	<ul style="list-style-type: none"> Automated station keeping Operational scripts TDRS encryption (secure enclave) External NEN (4800BB), ATF T&C
Tracking Services	<ul style="list-style-type: none"> Limited Radiometry 	<ul style="list-style-type: none"> TDRS tone ranging TDRS TDM generation 	<ul style="list-style-type: none"> BRTS 2-way Doppler and ranging 	<ul style="list-style-type: none"> Return channel time delay Time transfer MOC 1 and 2-way Doppler and ranging Track via NEN, DSN 	—
System Meas. & Test	<ul style="list-style-type: none"> S/Ku EET RF/IF 	<ul style="list-style-type: none"> Spectrum analysis All bitstream modes Internal and external source/sink 	<ul style="list-style-type: none"> PN & Tone ranging RF loops Block/Frame modes and coherency IF Loopback EET 	<ul style="list-style-type: none"> Initial EET loops via SM HMI Calibration UMOC Emulation 	<ul style="list-style-type: none"> Complete services



System Functions in Increments (cont..)



	A2 L3/L4 finish: 6/27/14	A3 L4 finish: 2/27/15	A4 L4 finish: 8/31/15	A5*	A6*
Planning & Scheduling		<ul style="list-style-type: none"> Schedule Import User supplied time periods (HMI) 	<ul style="list-style-type: none"> TTC and User Sched. Request (HMI) Manual Scheduling (Planning, Active/Operational) Schedule promotion Scheduling Rule Sets Service Agreements and Profiles 	<ul style="list-style-type: none"> Maintenance & Test Services² Schedule Request Recurrent and Splittable schedule request and scheduling Vector mgmt Planning Aids SN/CSM Proxy SN/FDF Proxy 	<ul style="list-style-type: none"> Automated and Semi-Automated scheduling Primary/Secondary Vector management Priority handling Apportionment Service Accounting DAS/SNAS Proxy Calendar Planning TUT/RUT
RTE / Schedule Execution	<ul style="list-style-type: none"> Initial Sched Exe TTC services HMI and recipe support Manual execute schedule at GT for TTC Services 	<ul style="list-style-type: none"> Manually execute schedule at GT for select Services Limited Active service control Service Status and Performance (HMI) 	<ul style="list-style-type: none"> Schedule Execution, all local User Services exc. Dig IF Schedule Execution, GT T&C Active Service Controls, Coherency, Service Modifications 	<ul style="list-style-type: none"> Schedule Exec. initial Test Services, User Tracking, Remote T&C Initial Service Recovery 	<ul style="list-style-type: none"> Schedule Exec Multisite Services, Service Recovery
Maint & Training	<ul style="list-style-type: none"> Basic Asset Mgmt 	<ul style="list-style-type: none"> Asset Mgmt (Maximo) Development build environment to output SRPs 	<ul style="list-style-type: none"> Additional SRP automation Maximo Maintenance Management 	<ul style="list-style-type: none"> MTFS and MS simulators 	<ul style="list-style-type: none"> All remaining MT functions Dropbox within Operational System

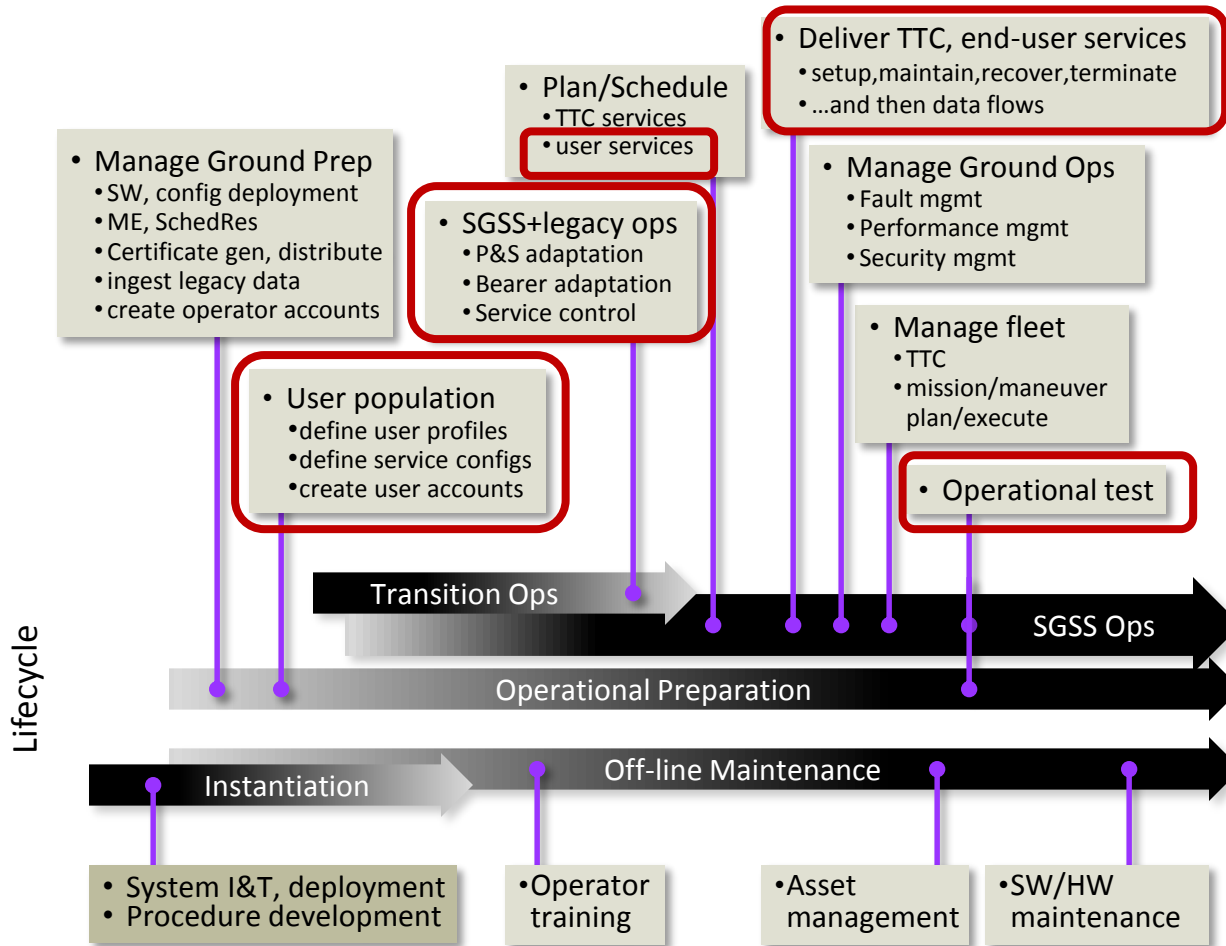


System Functions in Increments (cont..)

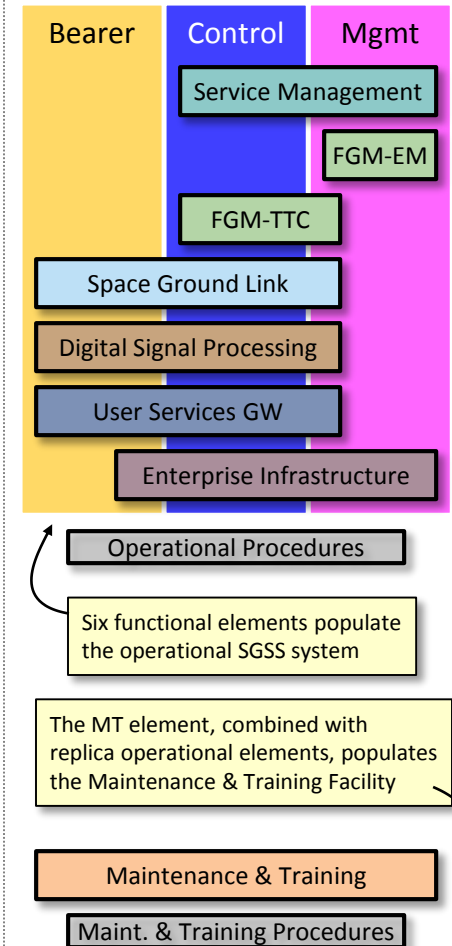


	A2 L3/L4 finish: 6/27/14	A3 L4 finish: 2/27/15	A4 L4 finish: 8/31/15	A5*	A6*
Network Mgmt / RMA	<ul style="list-style-type: none"> Config and Fault Mgmt test tool A2 ME support 	<ul style="list-style-type: none"> Fault, Config, Log Mgmt core integration w/ A3 MEs SW updates with HPOO, HPNA, HPNA ; SW patching Commission / decommission MEs 2N Subservice via SM HMI Initial mgt of SchedRes (M-0y.2, M-04.5) 	<ul style="list-style-type: none"> Fault, Config, Log Mgmt integration w/ A4 MEs Additional automation of software updates Additional failover modes Add'l SchedRes Commission/Compose (M-y.2) and Fault Mgt (CTMs/FGM-EM) SchedRes constraints (SM) 	<ul style="list-style-type: none"> Fault, Config, Log Mgmt integration w/ A5 MEs FM Scripting & correlation Additional-failover modes Final SchedRes Commission/Compose (M-y.2) and Fault Mgt (CTMs) 	<ul style="list-style-type: none"> Fault, Config, Log Mgmt integration w/ A6 MEs Performance Mgmt Trending and Analysis Final set of failover modes including SM controlled Service Recovery
Security	<ul style="list-style-type: none"> Basic Account management Access control of workstation RHEL hardening 	<ul style="list-style-type: none"> Account management Initial privilege mgmt Username/password based logon Internal GT firewalls Windows hardening Local audits 	<ul style="list-style-type: none"> Laptop/Removable Media encryption Additional platform hardening AV/HIDS Initial SIEM and Key Mgt integration with MEs 	<ul style="list-style-type: none"> Integrate Key Mgmt w/ MEs, incl. NOCA PIV based logon SIEM & automated audits Begin NIDs/Vulnerability Scan DMZ & NISN connection Network equipment hardening HAIZE 	<ul style="list-style-type: none"> MT DMZ Dropbox Complete SIEM & automated audits Complete NIDS / Vulnerability Scan <p><i>*TDRS encryption moved to TLM & CMD row</i></p>
Transition		<ul style="list-style-type: none"> Legacy analog IF support A3 example LOPs 	<ul style="list-style-type: none"> A4 specific LOPs 	<ul style="list-style-type: none"> Initial legacy adapters (TBD) A5 specific LOPs 	<ul style="list-style-type: none"> Remaining legacy adapters A6 specific LOPs

SGSS Behavior



SGSS Structure



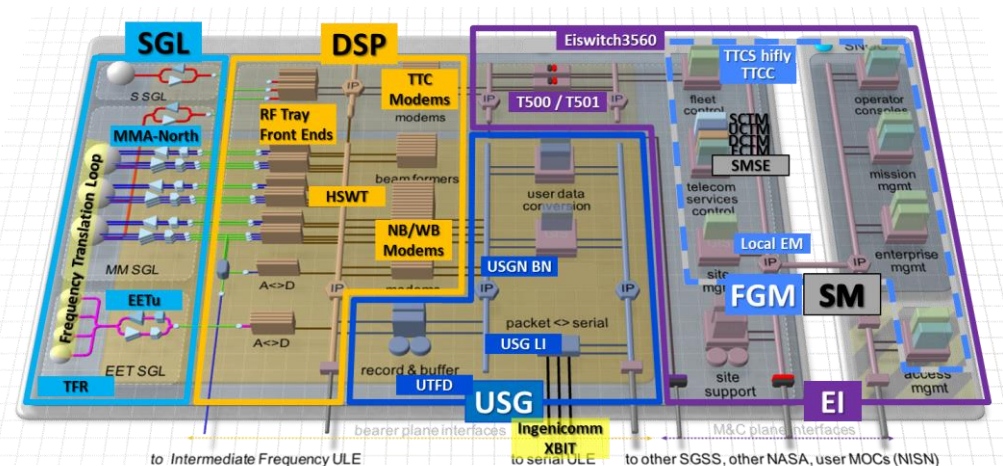


Significant Accomplishments

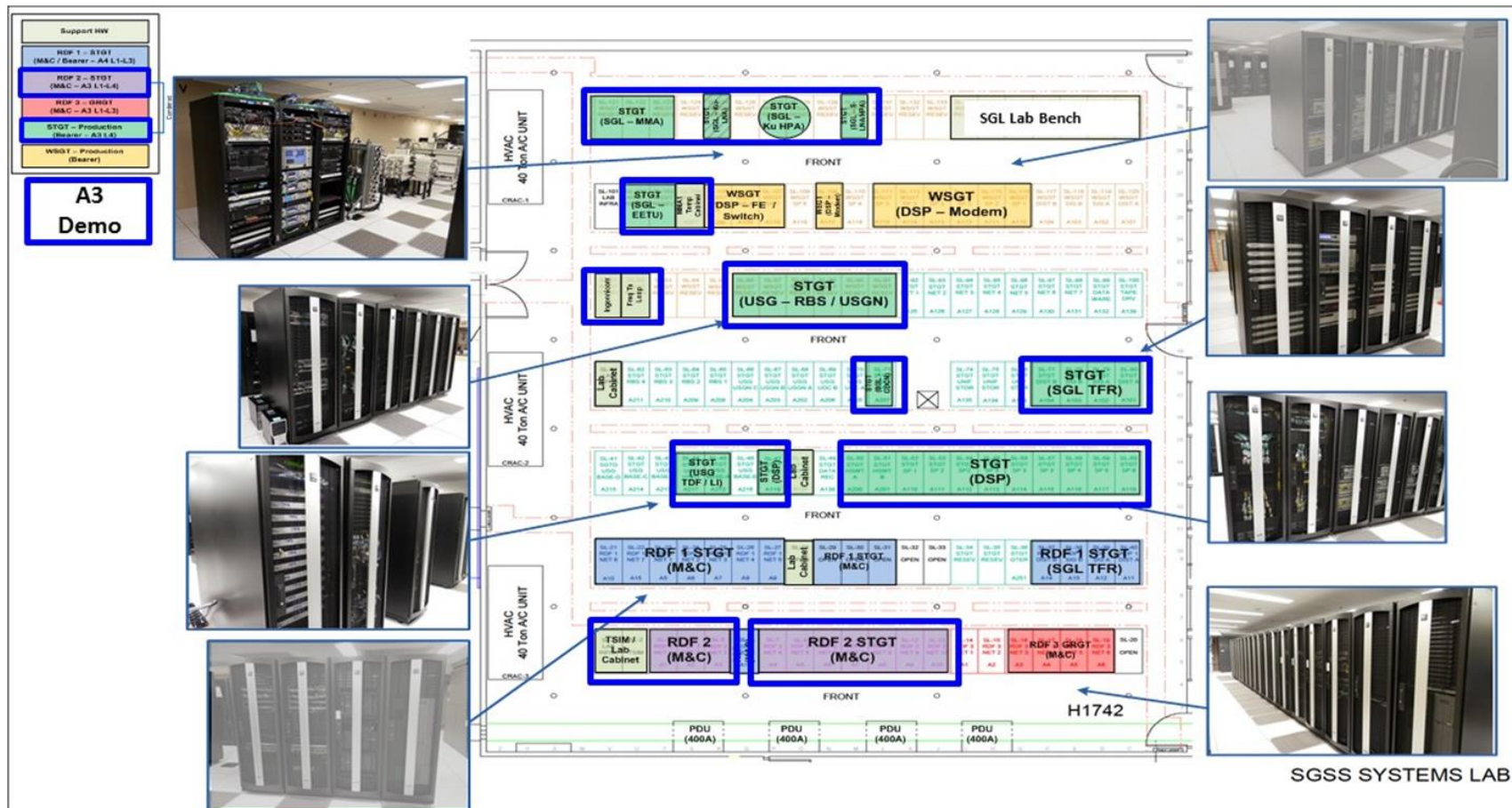


- ✓ **SGSS has completed the Project Life Cycle Phases A & B**
 - System Requirements Review held July 2011
 - System Preliminary Design Review held July 2012
 - Technical System Critical Design Review held June 2013
- ✓ **The SGSS design is mature and the system is proceeding through implementation**
 - Increment A2 has been completed
 - Completed initial bearer RF/IF integration
 - Initial TDRS Gen 1 Telemetry & Control capability
 - Fault management and configuration management integration as test tools
 - Increment A3 has been completed
 - Initial user service set-up and provision
 - Narrowband Modem Factory Acceptance Test completed
 - Demonstrated full bearer loop / A3 baseline
 - Increment A4 is in process
 - First major set of software drops completed; remaining drops on schedule.
 - Level 1 – 3 integration in process
 - Production Equipment for STGT has been ordered and is being received/assembled.

- The A3 Baseline demo developed system functions & capabilities.
- It highlighted the operation and interaction of multiple elements and the execution of end-to-end scenarios and capabilities.
- The 3 demo scenarios included:
 1. K-band TTC service
 - Schedule TTC K-Band services using SM SE HMI
 2. KSAF User Service (RS422):
 - USG Low Rate Bit stream LI through MMA Uplink
 3. Failover / Fault Recovery:
 - Observe event management



A3 Baseline Demo Equipment



Demonstration utilizes RDF2 and STGT equipment



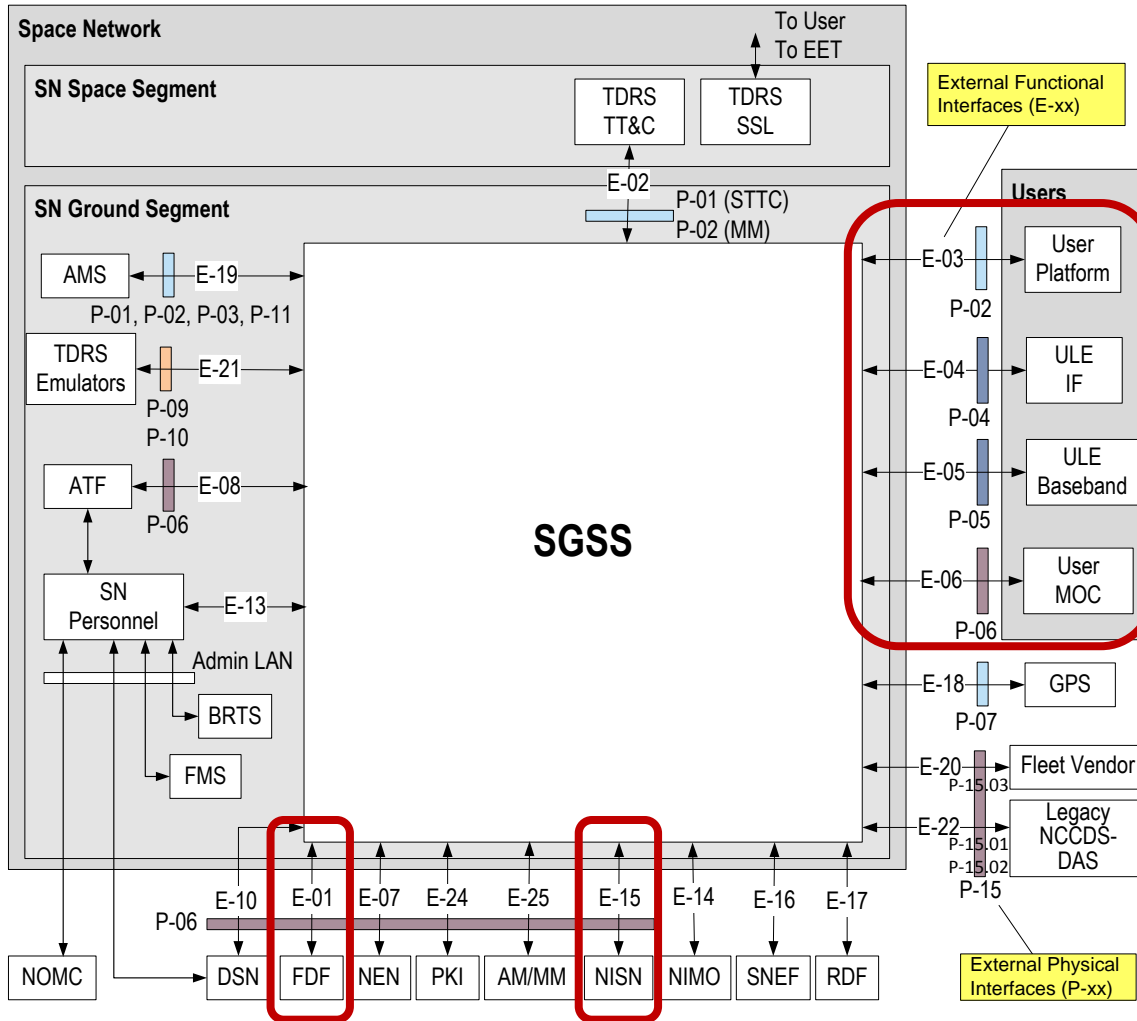
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SGSS Interfaces



- **SGSS Prime Contractor (General Dynamics) continues to incrementally mature all internal and external Interface Control Documents (ICDs) to define all SGSS Interfaces.**

- **Key External Root ICDs include:**

- User Platform
- ULE Intermediate Frequency (IF)
- ULE Baseband
- User MOC
- NISN
- FDF



Customer Interfaces



- **Service Scheduling (Service Management Element)**

- Ingest user requests from legacy SN scheduling systems and new SGSS HMI
- Validate requests against approved mission and service profiles
- Develop de-conflicted schedule for use of SN space and ground resources
- Issue directives to set-up and provision services, including bearer data processing (where applicable) and ground data transport
- Process allowable, in-service configuration changes

- **Data Transport (User Services Gateway Element)**

- Provide network for distribution of bearer data
- Protocol and data formats (legacy and new)
- Record and Buffer Service



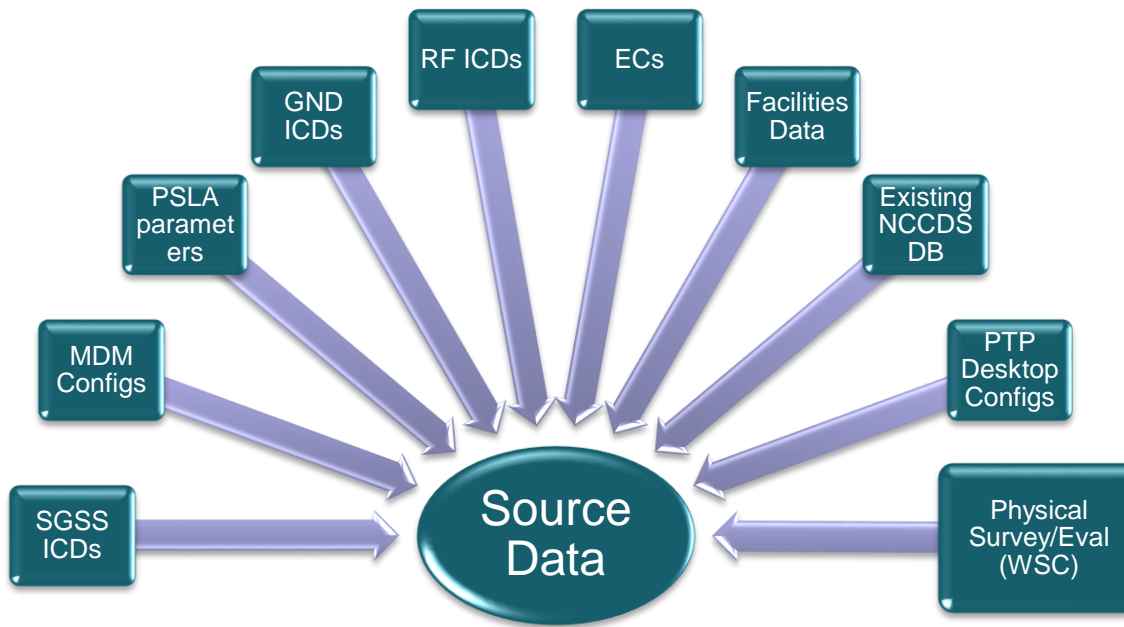
User Services Interfaces



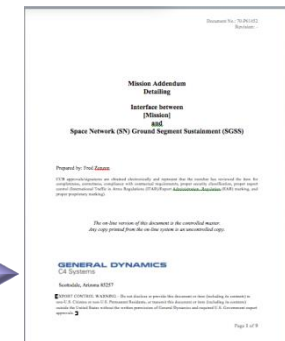
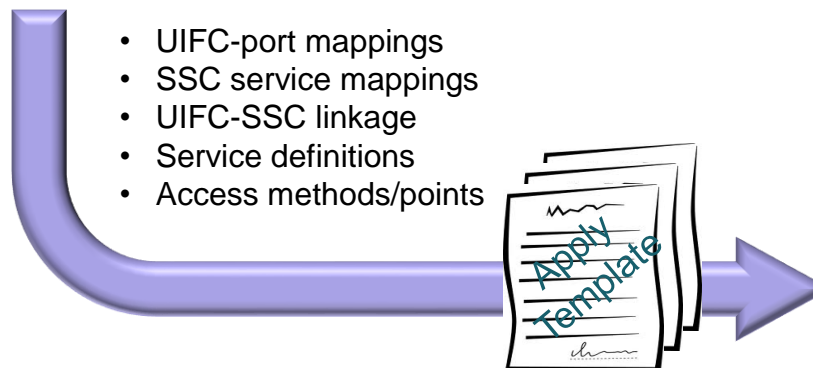
	PLOP								Interface										Payloads		
	Baseband								IF				Baseband								Baseband
	Forward				EET Return				ULE				ULE	ULE and Network					Legend		
Interfaces to payload / PLOP xref	PLOP 0	PLOP 1	PLOP 2 Asyn	PLOP 2 Sync	PLOP ASCP Not VRT	PLOP 0	PLOP 2 Sync	PLOP ASCP Not VRT	E-04.1	E-04.4	E-04.2	E-04.3	E-05.1	E-05.2 E-06.4	E-05.2 E-06.4	E-05.2 E-06.4	E-05.2 E-06.4	E-05.2 E-06.4	F - Forward EF - EET Forward R - Return ER - EET Return		
				X	X	X	X	X						F,EF,R,ER			F,EF,R,ER	F,EF,R,ER	AOS		
					X	X		X										F,EF,R,ER	AOS (IP)		
		X	X											F,EF			F,EF		TC		
		X	X			X	X	X						R,ER			R,ER	R	TM		
														F,EF			F,EF		Non CCSDS Fwd		
							X							R,ER			R,ER		Non CCSDS Rtn		
				X	X									F,EF			EF	F	CADU		
		X	X											F,EF			F,EF	F	CLTU		
	X			X			X	X						F,EF,R,ER	F,EF,R,ER	F,EF,R,ER	F,EF,R,ER		Bit Stream		
SN Service					Services / Antenna	Digital IF (Mbps)	Baseband (kbps) Min	Baseband (Mbps) Max	Analog Non-Digitized IF	MACE Digital VRT Pkt	Analog Tuned IF	Pkt VRT Digital IF	Serial BB	Pkt VRT BB	Legacy UDP BB	Legacy TCP BB	SLE BB	IP BB			
	RTN	Pol 1,2			1				X												
		MACE			1	8,715				X											
		KSAR 3			1	9,613	1000	1200	X			X	X	X	X	X	X	X	X		
		KSAR 2			1	7,690	1	600			X	X	X	X	X	X	X	X	X		
		KSAR 1			1	7,690	1	600	X		X	X	X	X	X	X	X	X	X		
		SSAR			2	854	0.1	24			X	X	X	X	X	X	X	X	X		
	FWD	MAR			8	291	0.1	7			X		X	X	X	X	X	X	X		
		KSAF			2	2,563	1	50			X	X	X	X	X	X	X	X	X		
		SSAF			2	854	0.1	14			X	X	X	X	X	X	X	X	X		
MAF			2	854	0.1	0.3			X		X	X	X	X	X	X	X				
	</																				



Mission-Specific Addenda Information Gathering



- **Data was collected from user mission representatives, NIMO, SN, and SGSS**
 - Overlaps and gaps were addressed
 - Resulting “Source Data” has received significant review
 - Templates reviewed independently
 - Source Data was used as inputs into one of 3 types of SGSS ICD templates
- **Each User Addendum contains user-specific information to be used at SGSS access points (i.e., interfaces, databases).**



User Addendum



Mission-Specific Addenda ➡ ICDs



- **As presented at last Customer Forum, GD produced initial set of customer-specific addenda that addressed how appropriate portions of comprehensive External ICDs would be configured for a given mission.**
- **Initial Addenda Set reviewed with SGSS Project, SN, NIMO, and some customer mission SMEs.**
- **Key benefits of Addenda activity:**
 - Gathered legacy, mission-unique configuration data (e.g., SSCs, UIFCs, TOCC updatable database table configurations, legacy USS logic, PTP desktop configurations) to support SGSS system design validation
 - Provided initial basis for mission-specific User Services data workbook to be used in developing service profiles and populating operational databases
- **SGSS is leveraging the Mission Addenda to develop a set of comprehensive SN to Mission ICDs**
 - NASA (i.e., SGSS and eventually the SN) will coordinate with Customer Missions, and maintain configuration control of SN to Mission ICDs
 - GD will maintain configuration control of User Services Data Workbook and master External ICDs



SGSS User Interface Types



- **Current Missions are categorized by SGSS “Interface Type”**
 - IF Services (supported only with User Local Equipment (ULE))
 - Analog Non-Digitized IF services
 - MACE Digital VRT Packet services
 - Analog Tuned IF - **New**
 - Digital IF – **New**
 - Baseband Services (all can be support with ULE or Network except for Serial –bit stream)
 - Serial
 - Packet VRT - **New**
 - Legacy UDP - current MDM users
 - Legacy TCP – current WDISC/SN Gateway users
 - SLE – **New**
 - IP MOC (IP/CCSDS) - **New**



Tracking Services



- **All SN Customers (including non-ULE MOCs) will have the new option to receive tracking data directly from the SN**
- **Tracking data will be available in both UTDF (legacy) and CCSDS (new) formats**
 - SGSS strongly recommends using CCSDS



Agenda



- **SGSS Management Overview (T. Gitlin)**
- **SGSS Technical Overview (V. Thanvi)**
- **Interface Overview (V. Thanvi)**
- **Scheduling Interfaces (J.P. Chamoun)**
- **Data Transport Interfaces (W. Eddy)**
- **Early Testing (N. Loomis)**
- **Deployment and Transition Updates (R. Von Wolff)**
- **Wrap-Up**



Outline



- **Recap of last customer forum**
 - Compare scheduling periods: Today's Vs. SGSS
 - Scheduling Interfaces
 - Transition Period Scheduling Impacts
- **SGSS HMI Overview**
 - Service Profile
 - Planning Aids
 - Schedule Request
 - Operational Schedule
 - Service Execution



SGSS Service Management Status



Where we are since the last customer forum

- Closed several open items in the E-06 ICD. Working on User Mission ICD Addendum.
- Mapping legacy service configuration parameters to SGSS database.
- Completed SM HMI mockups and User reviews. Now developing of operational HMI.
- Now developing the legacy proxies that will be used to mediate legacy user requests.

Service Management Terminology

- **Service Management:** this functionality type is used to describe all systems and information used to create service schedules
- **Control and Monitor:** this functionality type is used to describe all systems and information required to configure, execute, and status User Services
- **Human Machine Interfaces (HMI):** this interface type provides graphical displays to input and view scheduling information.
- **Machine Machine Interfaces (MMI):** this interface type provide an electronic connection with customer scheduling systems to receive and provide scheduling information directly to and from the SGSS scheduling system



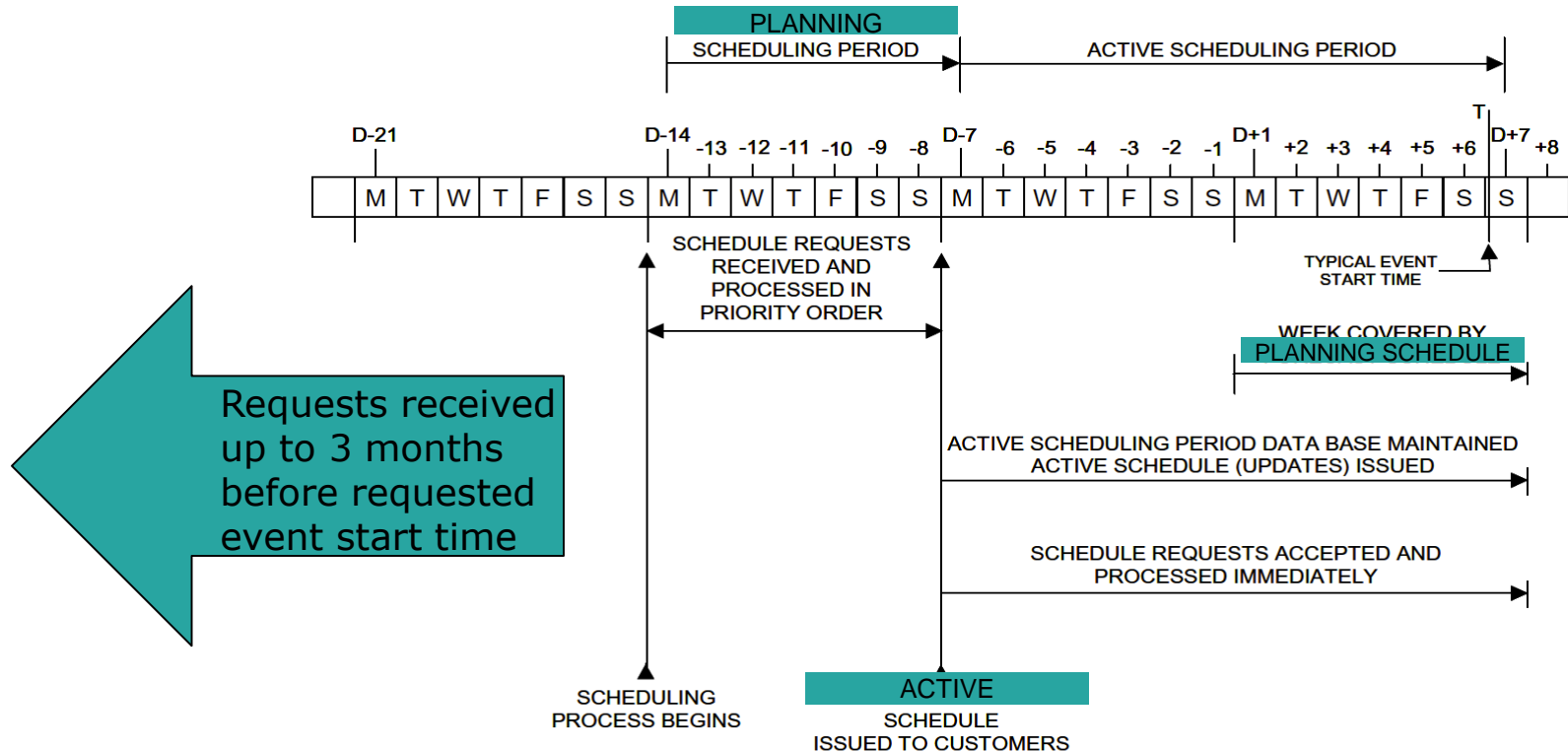
Scheduling Phases

No changes from last customer forum



Scheduling Periods

- Same scheduling time periods as today
- Requests accepted 3 months in advance
- The term “Forecast” is interchangeable with “Planning”



No impact to current customer scheduling timeline




Scheduling Interfaces

Minor changes from last customer forum



SGSS Scheduling Interfaces



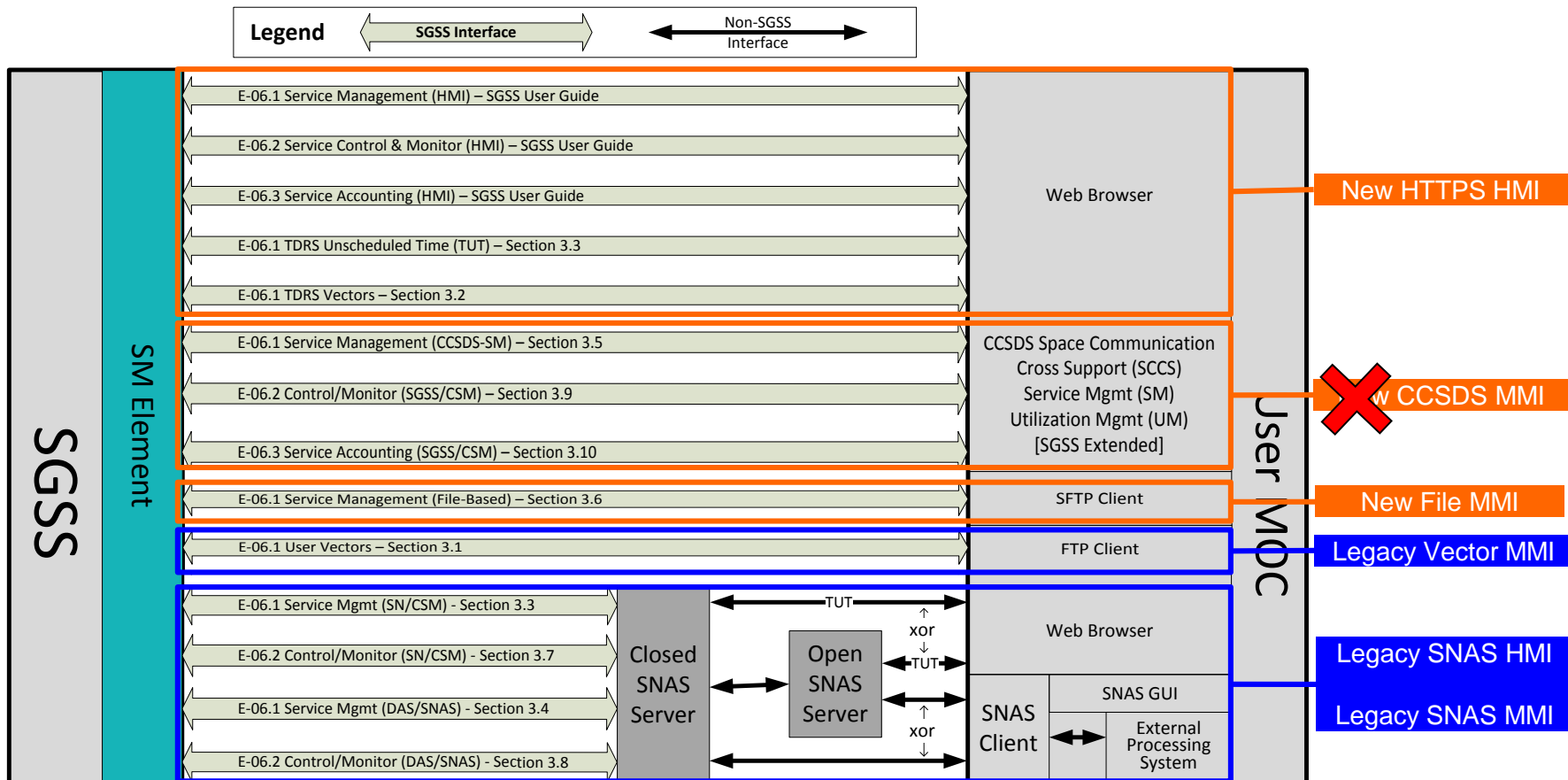
- **SGSS continues to support existing interfaces for existing customers**
 - SN/CSM
 - SNAS/DAS
 - MOC can continue to use their SNAS Clients
- **SGSS implements new scheduling interfaces and protocols providing the customer additional flexibility for managing and controlling services and the new SGSS service features.**
 - SGSS Web Portal HMI
 - CCSDS Service Management MMI 
 - SGSS/CSM MMI
- **SGSS Service Management & Control interfaces provides the following functionality to the customer:**
 - User and TDRS Vector
 - Service Management
 - Service Control and Monitor
 - Service Accounting

UPDATE: Waitlist and Alternative Schedule Add Requests (ASAR) are not supported in SGSS. Other SGSS features will provide similar functionality

UPDATE: CCSS Service Management is not supported in SGSS. There are no current customers for this interface and standard is being revised. Design allows for a future add-on interface.



Existing Customer Interface Support





SGSS Service Management HMI



SGSS HMI Salient Features



- **SGSS User HMI is a thin client (web browser access).**
 - Firefox, Internet Explorer, Safari, Safari (iOS), Chrome compatible.
- **Provides a rich feature based set of tools that permit Users to manage their SN usage from the highest levels (Service Level Agreement, Mission & Service Profiles, etc.) down to detailed individual service level control and service reporting details.**
- **Design effort has focused upon content and navigation.**
 - Ensure that Users have the content to assess status, make decisions, and efficiently schedule SN resources.
 - Ensure information content and controls are hierarchically arranged to maximize efficiency of use.
- **Many enhanced or new features (compared w/SNAS). Some examples:**
 - Calendar provides long term planning of major events and consumed resources.
 - Significant flexibility in setting up user specific scheduling constraints (e.g. movable, split-table, reoccurring, etc.)
 - Ability to pre-schedule GCMRs.
 - User can configure custom service accounting reports.
 - TUT summary display with savable search/filtered view settings.
- **WSC Operators and User see nearly identical HMIs.**



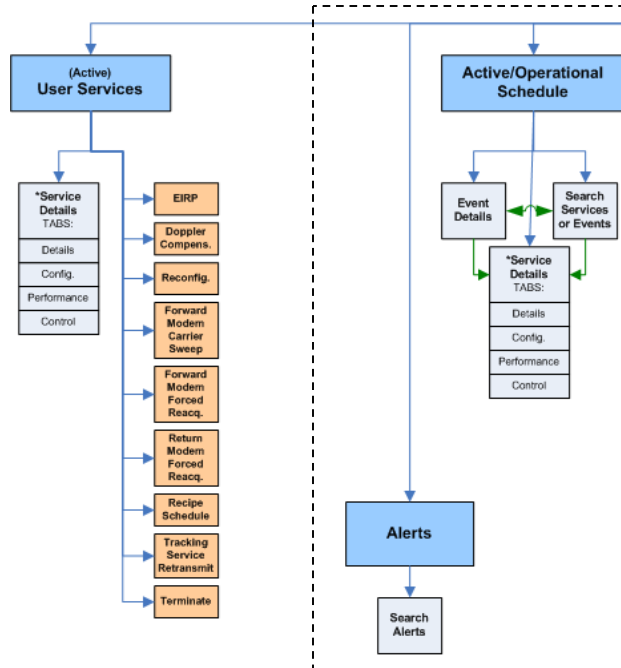
SGSS HMI Overview



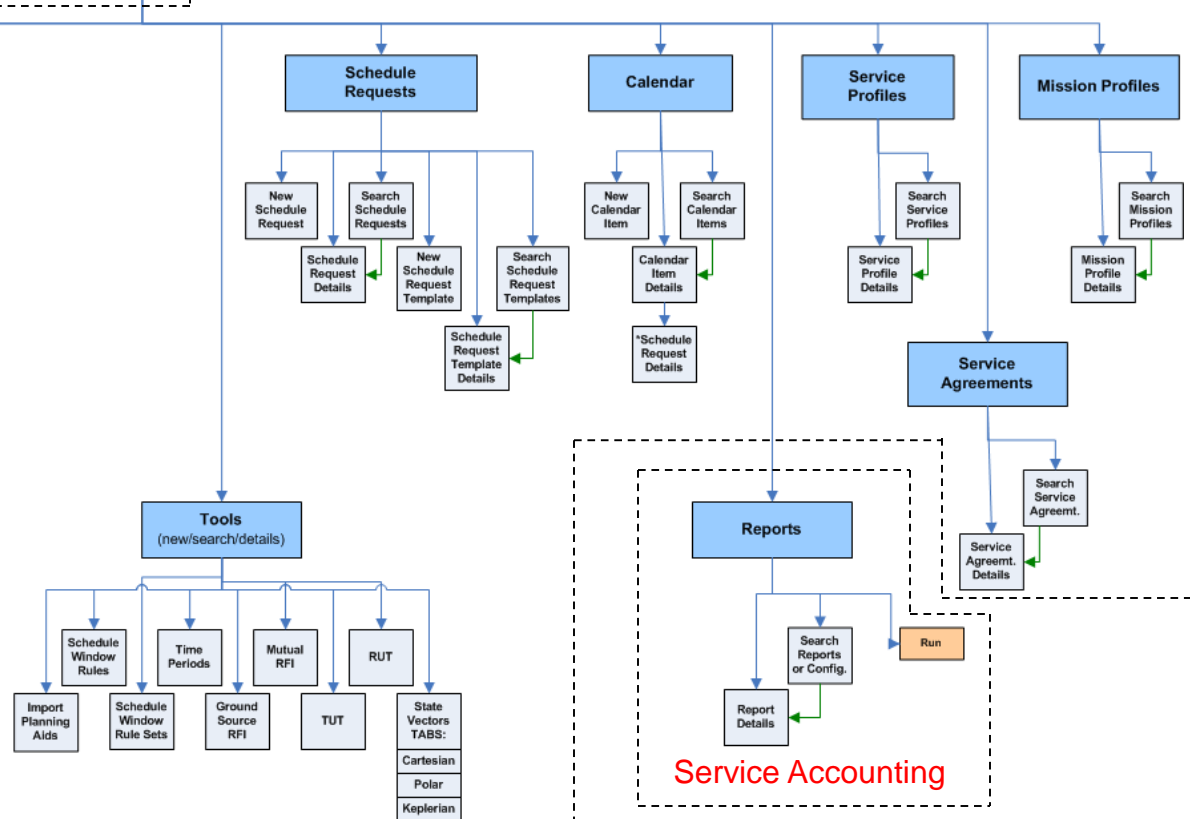
SM Home Page

- User HMI set consists of 3 parts; Service Management, Service Monitor & Control, Service Accounting & Reporting.

Service Control & Monitor (Execution)



Service Management



Service Accounting



Scheduling with the SGSS HMI



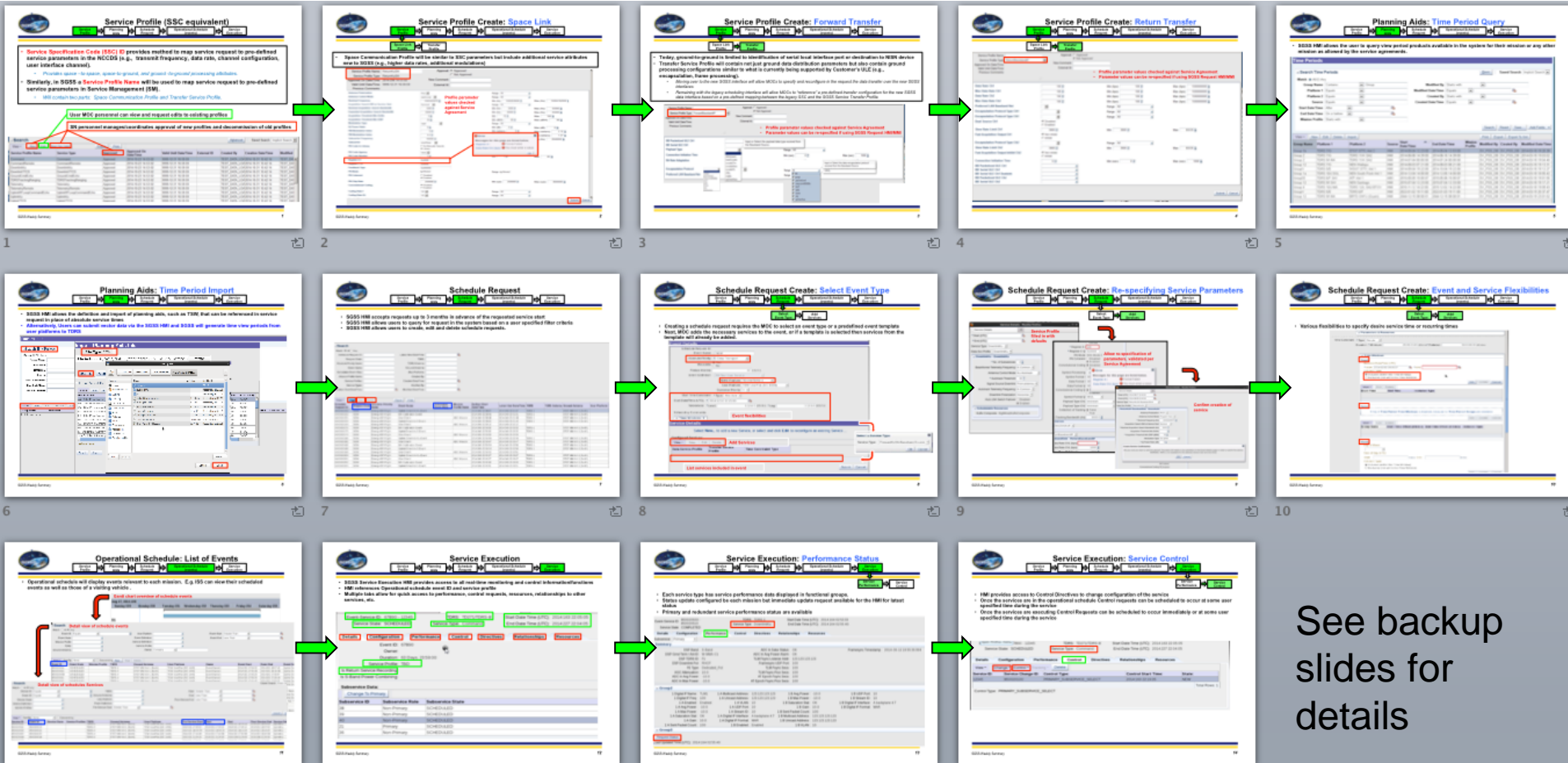
Service Profile

Planning Aids

Schedule Request

Active/Operational Schedule
(events)

Service Execution



See backup
slides for
details

These HMI are being used to perform SGSS system integration and testing of user services



Agenda



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- **Wrap-Up**



Outline



- **Introduction and Overview**
- **Documentation Available**
- **Interfaces for MOCs**
 - Legacy Interfaces
 - New Interfaces
- **Interfaces for ULE**
 - Baseband Service Interfaces
 - IF Service Interfaces
- **Specific Questions:**
 - Availability of Digital IF Services
 - Common UIFCs
 - Customer Interface Ports



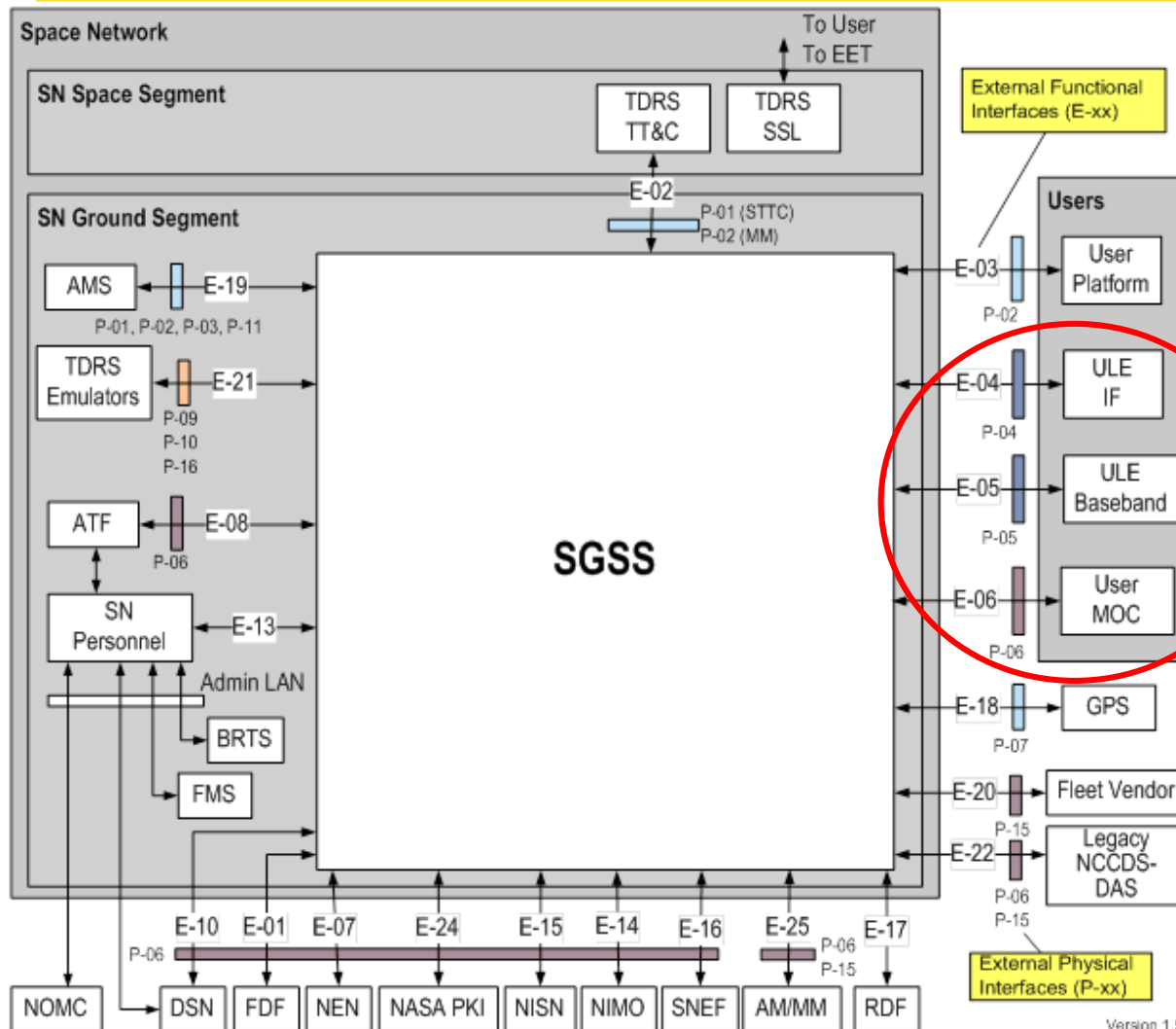
Introduction and Overview



- **The current legacy SN has several different types of data interface**
 - Some types have multiple configuration options and parameters
- **SGSS plans and design are to support all legacy real-time and playback data interface configurations that are currently in use**
 - Some options or parameters that are not in use, and not desirable to maintain, are not a part of the SGSS baseline, but should not impact existing users
- **SGSS is also offering additional new data interfaces beyond those available in the legacy SN**
- **Stored data is available for retrieval as a playback (not a file transfer)**
- **SGSS is working with each mission individually on ICD documentation**
 - The ICDs are reviewed in conjunction with representatives from each mission
 - During this process, the detailed legacy configuration is translated into SGSS-specific configurations
 - Any new or changing needs can be discussed between projects during this process



SGSS Data Transport Interfaces



- Three SGSS data transport interfaces are defined separately at the system level:
 - E-04: ULE IF
 - E-05: ULE Baseband
 - E-06: User MOC
- Each supports multiple different types of data flows
- Recent work / changes are in-progress to homogenize E-05 and E-06 packetized flows, enabling new options and simplifying some aspects of the design



Documentation Available



1. P-04/E-04 ICD

- Space Network (SN) Ground Segment Sustainment (SGSS) to User Local Equipment (ULE) Intermediate Frequency (IF) Interface Control Document (ICD)

2. P-05/E-05 ICD

- Space Network (SN) Ground Segment Sustainment (SGSS) to User Local Equipment (ULE) Baseband Interface Control Document (ICD)

3. E-06 ICD

- Space Network (SN) Ground Segment Sustainment (SGSS) to User Mission Operations Center (MOC) Interface Control Document (ICD)

4. Individual user mission ICD documents are being developed as addenda to E-06

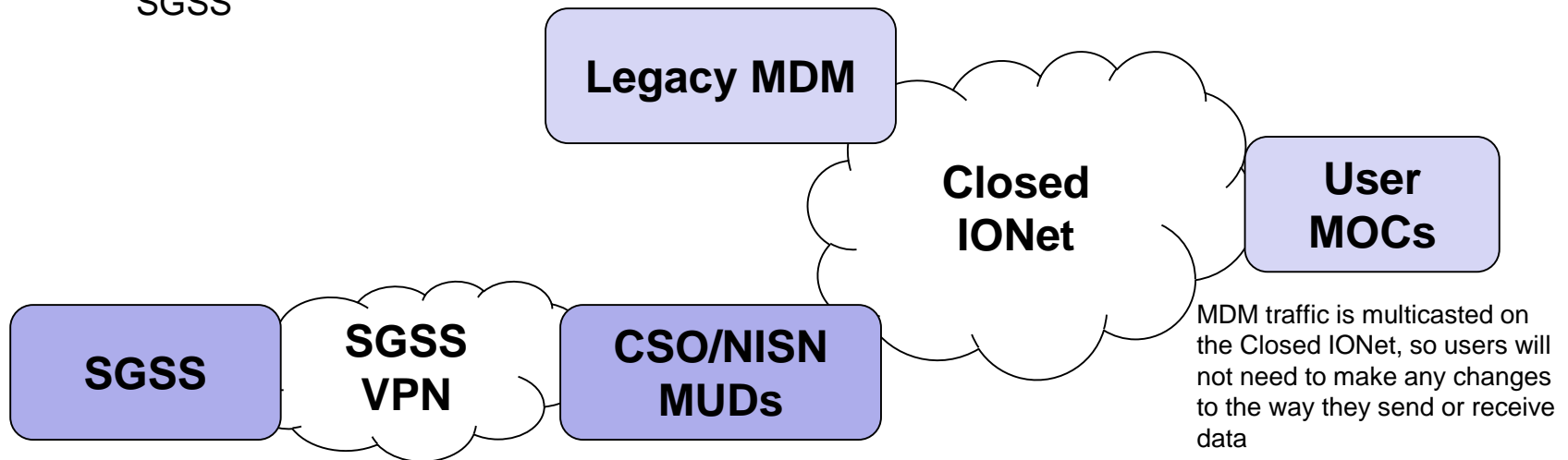
- ICD addenda process discussed at previous Customer Forum is being carried out, including inputs from all relevant sources. (see next slide)
- This is where specific configurations, options, and parameters are determined and verified within the SGSS design
- IP addresses and TCP port numbers need to be conveyed and verified by the missions in order to ensure correct SGSS security device configurations



Interfaces for MOCs – Legacy MDM



- **SGSS will continue to support 4800 Bit Block users on the Closed IONet**
 - This interface will be mostly unchanged from the user perspective
- **Changes from legacy behavior:**
 - For source/destination fields in the 4800BB, 0x16 will be used, rather than legacy values of both 0x15 (WSGT) and 0x16 (STGT)
 - Line Outage Recording (LOR) functionality is separately scheduled (see later slide)
 - SGSS will not have machines on Closed IONet, but will utilize CSO/NISN-provided conversion devices (MUDs) to bridge between MDM customers on the Closed IONet and SGSS





Interfaces for MOCs – Legacy WDISC/DAS/SNG



- **Legacy WDISC, DAS, and SN Gateway Customers**
 - Many options currently supported in legacy WDISC and DAS (LEO-T, IPDU, etc)
 - SN Gateway also supports CCSDS SLE F_CLTU, RAF, RCF
 - SGSS unifies support for all three legacy subsystems within the User Data Conversion (UDC) subsystem that handles all MOC data flows
 - Options that are supported by SGSS are generally constrained to those that are either in-use by existing/planned customers in the SGSS deployment timeframe, or specific by SCan requirements

- **Changes from legacy behavior:**
 - IPDU and LEO-T header destination field values will not be filtered by SGSS
 - Outgoing connections to the MOCs will come from a pool of SGSS IP addresses at the ground terminal the service is being provided at
 - Legacy connections come from a small number of PTPs
 - Firewall rules need to accommodate connections from SGSS address pool (information provided during ICD addenda process)
 - Incoming connections from the MOCs will go to IP addresses specific to the ground terminal the service is being provided at
 - Legacy connections all went to WSC



SLE Interfaces for MOCs



- **CCSDS SLE ROCF – New for SGSS**
- **CCSDS SLE Enhanced Forward CLTU (EF_CLTU)– New for SGSS**
 - Per CCSDS Orange Book specification
 - Permits transport of forward data units other than CLTUs (including Transfer Frames and CADUs)
- **SGSS supports the SLE book revisions that were most recent at the time of requirements definition, and will accept BIND requests for the protocol version numbers listed.**

Standard	CCSDS Book Number	Book Revision	BIND "version-number"	SGSS Supported
RAF	911.1-B	2	2	yes
		3	4	no
RCF	911.2-B	1	2	yes
		2	4	no
ROCF	911.5-B	1	1	yes
		2	4	no
F_CLTU	912.1-B	2	2	yes
		3	4	no
EF_CLTU	912.11-O	1	101	yes

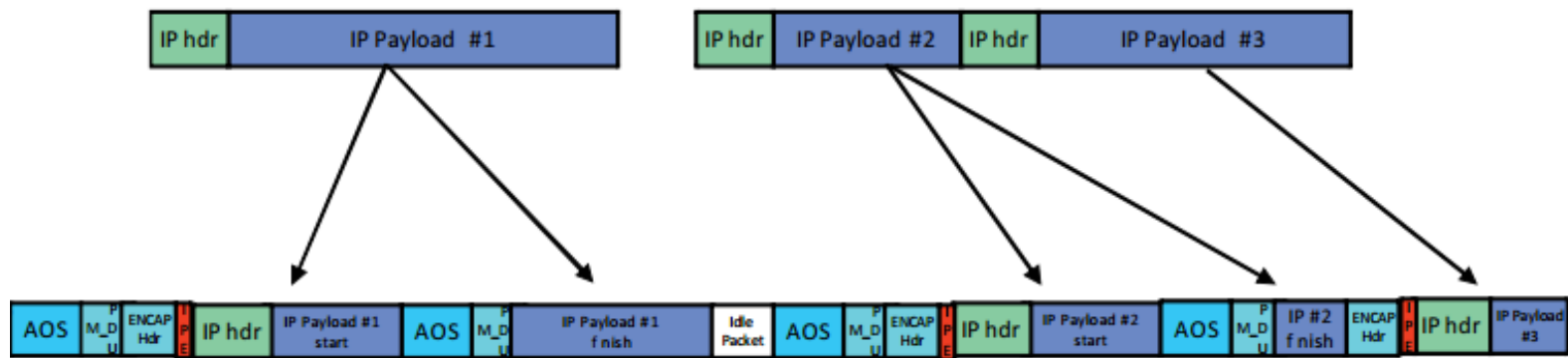


IP Addressing for WDISC/DAS/SNG and new SLE Users



- **SGSS uses new IP addresses in a different block from what the legacy systems operate within**
- **Connections to and from SGSS will be using the new addresses**
 - During transition, some connections will be made using legacy addresses and others will be made using SGSS addresses, dependent upon the TDRS satellite / SGLT in use for the service
- **Existing users that make incoming connections (e.g. for SLE) will be assigned fixed SGSS addresses to connect to at each ground terminal**
- **New SLE users will be provided with the address to connect to at the time of service scheduling, via scheduling messages**

- **SGSS includes support for Internet Protocol over CCSDS AOS space links**
 - Available for forward and return services
 - CCSDS Encapsulation Packets (133.1-B-2) with the Internet Protocol Extension are used within the M_PDU zone of AOS frames
- **Implemented in accordance with material in CCSDS Blue Book 702.1-B-1**
- **IPsec and IP-in-IP tunneling will be used across the ground network between the customer and SGSS to preclude routing issues in the terrestrial network**
- **First “space internetworking” service offered by SCaN**



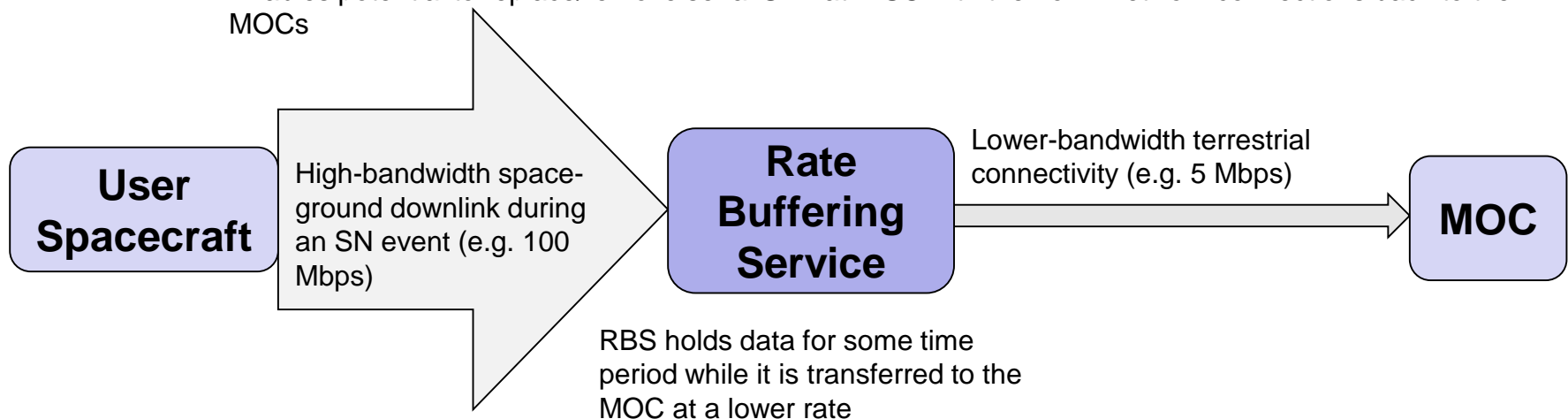


Rate Buffering – New SGSS Capability



- **Record and Buffering System (RBS)**

- Replaces legacy Line Outage Recorder (LOR) and Return Service Data Recorder (RSDR) functionality
- Recording can be requested during service scheduling for remote MOC data flows
- Playback of data can also be requested after an event using the same transport encapsulation
- SGSS adds a new rate-buffering functionality for cases where the space link data rate is higher than the bandwidth available to the MOC
 - Data from a high-rate return link is held in the SN and trickled back to the MOC over a longer time period, at a lower terrestrial data rate
 - Enables potential to replace/remove serial ULE at WSC with their own network connections back to the MOCs





Baseband Service Interfaces for ULE



- **Serial Baseband**

- Low-Rate (RS-422) - 100 bps to 12 Mbps
- High-Rate (ECL) - 10 Mbps to 300 Mbps
- On return service loss of bit-lock, SGSS behavior changes from legacy system and sends random bits, rather than all one bits
- No other interface changes visible to serial baseband users

- **New for SGSS - Packetized Baseband**

- Supports the maximum rates of user space link services
 - Up to 1.2 Gbps user data rates (return services)
- Uses a specific type of VITA 49.0 Radio Transport (VRT) packet defined for carrying serial baseband data within UDP/IP over Ethernet
 - Contains timestamps and packet counters
 - Alternatively, E-06 interface protocols available to a remote MOC are now also planned to be available for packet ULE
- Can be 10 Gbps or 1 Gbps physical Ethernet interface depending on customer needs



VRT Packetized Baseband Format



VITA 49.0 Radio Transport (VRT)

- SGSS-tailored version of the VRT standard in order to packetize serial data
 - Intended primarily for local equipment, rather than remote MOCs, but available to both
- Sent over UDP/IP – no ability to correct for packet loss

Bit Offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	PT				C	T	R	R	TSI			TSF		PC			Packet Size															
32	Stream Identifier (1 word)																															
64	Class Identifier (2 words)																															
96																																
128	Integer-seconds Timestamp (1 word)																															
160	Fractional-seconds Timestamp (2 words)																															
192																																
224	Payload																															

- Full definition is in the E-05 ICD
- Very simple format
 - Possible for customers to implement processing efficiently in software or hardware / VHDL
- Only data interface capable of maximum SGSS return data rates (1.2 Gbps)



IF Service Interfaces for ULE



- **Analog – Return services only**
 - Never digitized wideband: 1345 MHz center
 - Tuned analog narrowband: 370 MHz center
- **TDSD**
 - RF taps for will be retained and SN will continue to provide the service unmodified
- **New for SGSS - Digital IF – Return services only**
 - VITA 49.0 Radio Transport (VRT) packet format
 - Uses UDP/IP over 10 Gbps Ethernet
 - Customer equipment connects to a standard Ethernet port
- **New for SGSS – MACE – Return services only**
 - For MA users that will perform their own beamforming and other signal processing
 - See next slide





Availability of Digital IF Services



- **The ULE Network includes a pair of Cisco 5596UP Ethernet switches (A-side and B-side), at each ground terminal (WSGT, STGT, BPGT, GRGT) that support all packetized ULE interfaces**
 - The switches each have 48 fixed / built-in ports, and can be expanded with additional modules to 96 ports
 - Ports can be populated with 10 Gbps or 1 Gbps SFP+ modules
- **The ports are connected to:**
 - Customer ULE requiring:
 - Digital IF
 - MACE
 - Packetized Baseband
 - NTP
 - SGSS systems supporting the service flows
- **Port needs for Digital IF should be included in the customer addenda**



Other Specific Questions



- **Common UIFCs**

- Some legacy UIFCs are common to ports at both STGT and WSGT or GRGT
 - Enables fewer SSCs to be managed by the user
- The legacy SN sends the SHO to the proper GT for the TDRS that has been scheduled, and the port at that GT is used for subsequent data flow
- SGSS will operate similarly in selecting a transfer service profile for a scheduled event
 - Data will NOT be delivered to multiple serial ports simultaneously in this case

- **Customer Interface Ports for ULE**

- There are two sources of ULE port count data for SGSS:
 - User mission ICDs/addenda documents
 - Include both new and legacy port types
 - SN port workbook
 - Maintained by SN based on actual connections
 - Includes only legacy port types
- SGSS serial interfaces are conversion cards, and not simply ports on a crossbar switch
 - Port counts reflect the number of in-service conversion cards simultaneously in the system



Agenda



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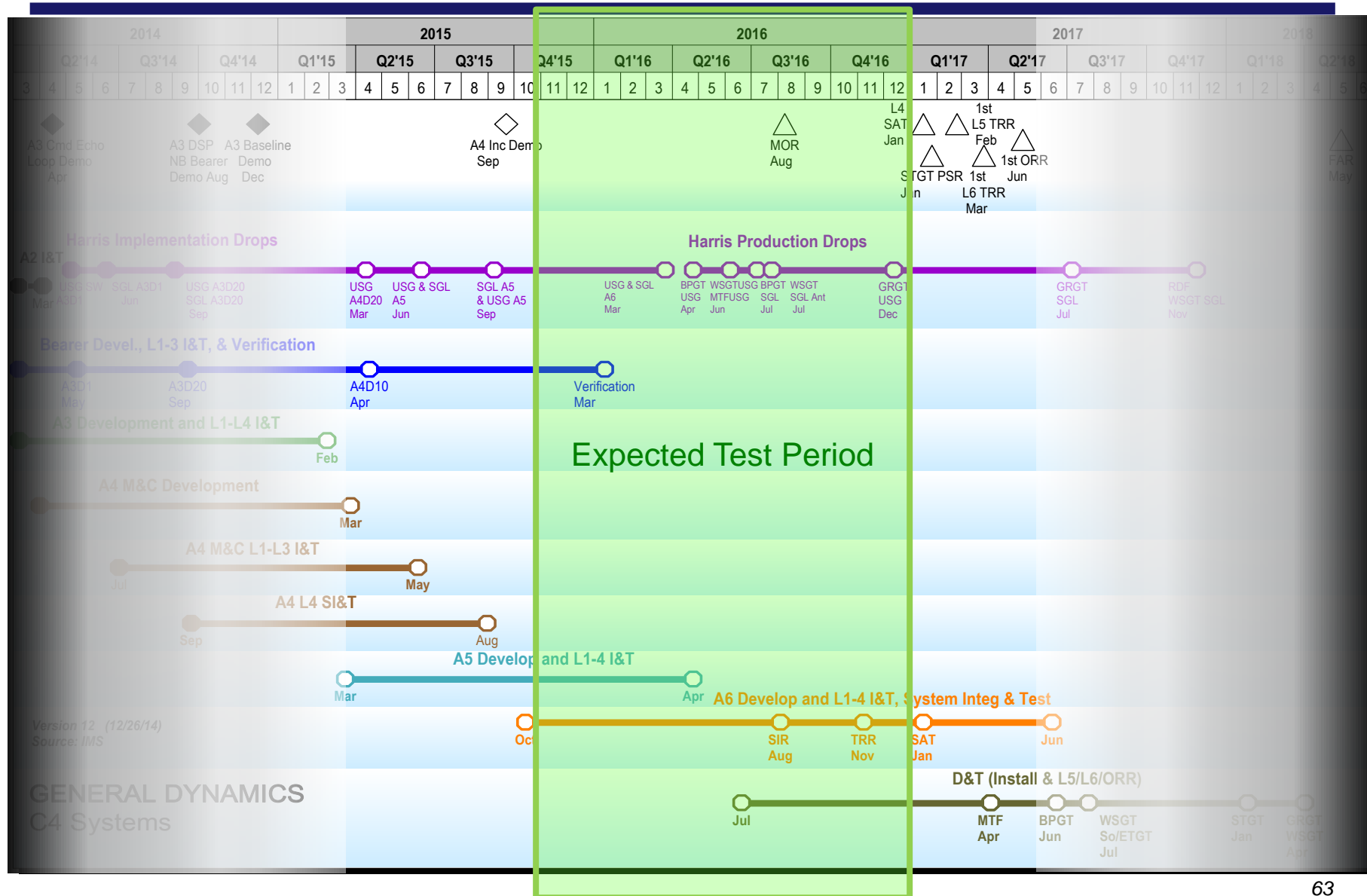
Early Testing Overview



- **SGSS is undertaking an Early Test effort to evaluate SGSS interfaces with external entities prior to deployment to WSC**
- **Goals:**
 - Mitigate risk to L5/L6 Testing from WSC
 - Establish interfaces to facilitate early identification of mismatches on the structure and/or in processing of data
 - Increase confidence in success of migration from current SNGS to SGSS interfaces
- **Basics:**
 - Incremental testing aligning with GD development activities over 9-month period starting October, 2015
 - Targeting 3 3-month intervals starting in October, 2015
 - A4/A5/A6
 - Connectivity would be to GD lab facility in Scottsdale, AZ
 - Connection into NASA's Network facilitated by CSO

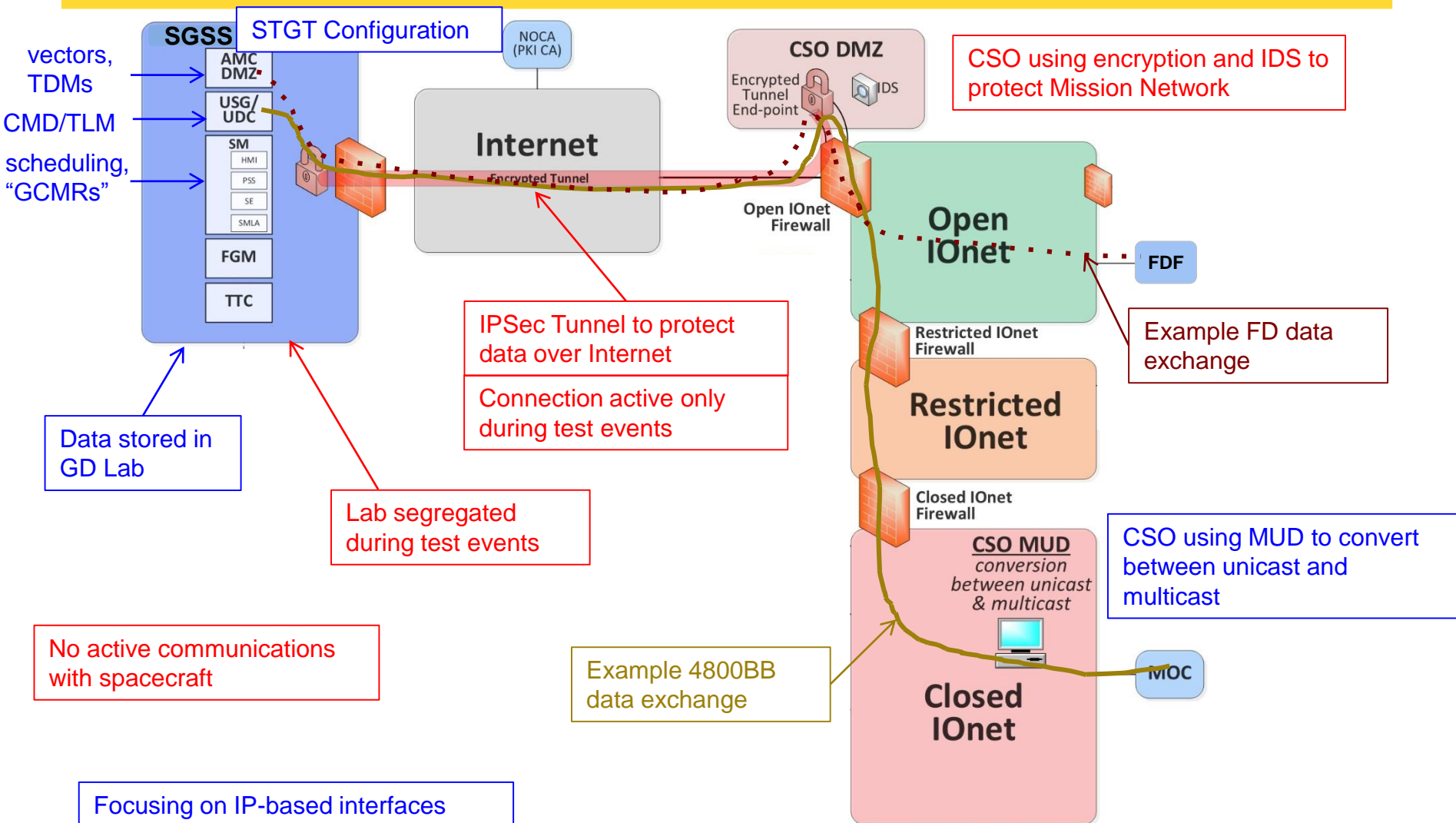


Early Test Period (Calendar Year)





GD Lab Connection To NASA's Network





Roles (1)



- **General Dynamics Leading Test Planning Efforts**
 - Identifying functionality and timeframe for testing
 - Identify test criteria and scope
 - Creating test planning documents and test procedures
 - Reviewing, updating documentation based on Early Test activities
 - Executing test events
- **SGSS Project Facilitating Coordination**
 - Coordinating among GD, CSO, SN, Endpoints for planning and execution
 - Reviewing Operational and Test information for Early Test activities
 - Prioritizing mission-inclusion, needs, etc
 - Constructing FW rules, etc
 - Serve as Test Director for coordinating and conducting test events
- **CSO**
 - MOU between SGSS and CSO for Early Testing
 - Waivers for subset of testing data flows (e.g., possible IP on Closed IONet)
 - SGSS Project is working with NISN to provide waivers
 - IPSEC tunnel and testing



Roles (2)



- **SN**
 - Super-endpoint + partner
 - Review Early Test information, critique and work to improve data/plans
 - Provide data with permission of missions
 - Act as endpoint/proxy
- **Endpoints (e.g., missions, FDF, etc.)** – Final Determination**
 - Will they participate?
 - To what extent will they participate (e.g., interface(s), active/passive involvement)?
 - What data is used?

Participant: FDF
Participation Type: Active participation
Interface(s): SFTP, HTTPS
Data: IIRV, TOE, TLE, Maneuver Messages

*** Note: For missions, this includes NIMO which is facilitating discussions and providing input on plans/processes*



Interface/Functional Test Schedule



• July, 2015

- Start Connectivity (Scottsdale/NASA) testing

• Oct-Dec, 2015

- **FDF**: Bi-directional Maneuver messages, vector data (to SGSS)
- **NEN**: TDMs (to SGSS), vector data (from SGSS)
- **DSN**: TDMs (to SGSS), vector data (from SGSS)

• Jan-Jun, 2016

- CMD/TLM
- User vectors
- Scheduling
- TDMs to FDF

ID	Ext. End	Elm	Information		Physical	Propose
E-01	FDF	SM	Ephemeris and Maneuver Messaging	E-01.1	P-06.01	Post A4
		SM	TDRS Vectors (Message Based)			
		SM	User Vectors (Message Based)			
		SM	TDRS Vectors (File Based)			
		SM	TDRS Vectors (Web Portal HMI)			
		SM	User Vectors (Web Portal HMI)			
		SM	BRTS Schedule Requests & Status (Web Portal HMI)			
		SM	TDRS Maneuver Messages			
		USG	Tracking Data Messages (TDM for some Users and TDRS)	E-01.2		Post A5
E-03	User Platforms	USG	User non-CCSDS data physically carried through TDRS and SGSS.	E-03.1	P-02.01	
		USG	User CCSDS data physically carried through TDRS and SGSS.	E-03.2		
		DSP	User lower level signal data - waveform modulation, sync and channel coding, and PN ranging.	E-03.3		
E-06	User MOC	SM	User Service Management	E-06.1	P-06.01	Post A6
		SM	User Service Management (Web Portal HMI)		P-15.01	Post A6
		SM	User Schedule Requests & Status		P-06.03	Post A6
		SM	User Planning Aids		P-15.02	Post A6
		SM	TDRS Vectors			Post A6
		SM	User Vectors			Post A6
		SM	User Profiles & Modification			Post A6
		SM	User Service Management (SN/CSM)			Post A6
		SM	User Schedule Requests & Status			Post A6
		SM	User Planning Aids			Post A6
		SM	User Vectors			Post A6
		SM	User Service Management (DAS/SNAS)			Post A6
		SM	User Schedule Requests & Status			Post A6
		SM	User Planning Aids			Post A6
		SM	User Vectors			Post A6
		SM	User Vectors for S/C not supported by FDF (FTP)			Post A6
		SM	TDRS Elements (HTTP)			Post A6
		SM	User Service Out-of-Band Control & Monitor	E-06.2		Post A6
		SM	User Service Control & Monitor (Web Portal HMI)			Post A6
		SM	User Out-of-Band Control & Status			Post A6
		SM	User Performance Data			Post A6
		SM	User Service Control & Monitor (SN/CSM)			Post A6
		SM	User Out-of-Band Control & Status			Post A6
		SM	User Performance Data			Post A6
		SM	User Service Control & Monitor (DAS/SNAS)			Post A6
		SM	User Out-of-Band Control & Status			Post A6
		SM	User Performance Data			Post A6



Early Testing – Security Status



- **Briefed CSO on security plans for early testing on 2/6**
 - CSO's only concern was with troubleshooting the IPSec tunnel
 - Several waivers will be needed for exceptions to CSO policy
 - CSO and SGSS to draft an MOU to cover security controls, and operational issues
 - No impediments to moving forward
- **Because we are using CSO IP address space, we will acquire Authorization to Test (ATT) based upon**
 - Existing security documentation for the system
 - White Paper that includes lab security controls
 - Existing Plan of Action and Milestones tied to SGSS development plan
 - MOU between CSO and SGSS
 - CSO security waivers
 - Approval by System Owner: Roger Clason



Security Controls



- **Prior to connection:**
 - Provide detailed network diagram for lab connection
 - Register all IP addresses with CSO
 - Credentialed scan prior to connection and will mitigate risks
 - Security incident reporting to SOC
 - Establish position of test director to coordinate and control test activities
- **Current plan uses encrypted tunnel (ssl, IPsec) over Internet**
 - Protects confidentiality and integrity of data
 - Minimizes cost and schedule impacts
 - Expect to terminate encrypted tunnel in CSO managed DMZ
 - Expect CSO IDS
- **No data flows between SGSS and IOnet outside announced tests**
 - GD Lab connection to NASA only enabled during test periods, else disabled
- **No actual communications with satellites will occur**
 - Testing will be performed using Lab components



Security Controls (cont)



- **Initial security controls at start include:**

- Sufficient physical controls covering building, perimeter, and lab access
- Sufficient personnel controls covering background checks, clearance, and policies
- Initial access controls including Account passwords, warning banners, & unsuccessful login attempt lockout
- Initial auditing controls including audit storage capacity alarms, and reporting of security events to the SIEM for key system components
- Initial configuration management controls including automated enforcement of access restrictions, and hardening of database/app servers, virtual servers, and domain controllers
- Initial implementation of Anti-Virus and Host Intrusion Detection (HIDS) tools
- Initial configuration of switch, router, firewall, and load balancer devices
- Encryption of removable media, and full-disk encryption of Laptops
- Implementation of IPSec tunnel for internal connection between GD Lab and CSO



Mapping Missions for Early Testing



- Maps missions to interface(s) and unique characteristics
- Used for interface coverage evaluation and mission discussions
- Based on E-06 addenda

Mission/endpoint	Interfaces		Scheduling		HMI	UDP-4800BB	TCP - TM/LEC	TCP-AOS/LEC	TCP-
	SNAS	DAS/SNAS	Direct (non-S	NCCDS					
ULA	x				HMI not included as acc	x			
Van Allen Probe	x								
NEO WISE	x						x	x	
Landsat-8	x						x	x	
LDBP									
AIM	x						x	x	
AQUA			x						
Aura			x						
Cygnus	x					x			
Dragon	x					x			
Glast (Fermi)	x	x						x	
GPM	x								x {
HST	x					x			
HTV	x					x			
LSAT-7	x								x {
Minotaur	x					x			
MMS	x						x	x	
NuSTAR	x						x	x	
SeaLaunch	x					x			
SORCE	x						x	x	
SPTR-2	x								
SWIFT	x	x						x	
TERRA			x						
THEMIS	x						x	x	
TIMED	x						x		
OCO-2									
JWST									
ISS									
MTRS and SMAP									
BRTS/SN									
JPSS (preliminary)	x								
SCAN Testbed									



Early Testing POCs



	Role	Phone	Email
Jim Clapsadle	SGSS I&T Lead	301-286-5111	James.E.Clapsadle@nasa.gov
Nicole Loomis	Early Test Lead	301-286-5428	nicole.loomis@nasa.gov



Agenda



- **SGSS Management Overview (T. Gitlin)**
- **SGSS Technical Overview (V. Thanvi)**
- **Interface Overview (V. Thanvi)**
- **Scheduling Interfaces (J.P. Chamoun)**
- **Data Transport Interfaces (W. Eddy)**
- **Early Testing (N. Loomis)**
- **Deployment and Transition Updates (R. Von Wolff)**
- **Wrap-Up**



D&T Updates Since The Last Customer Forum

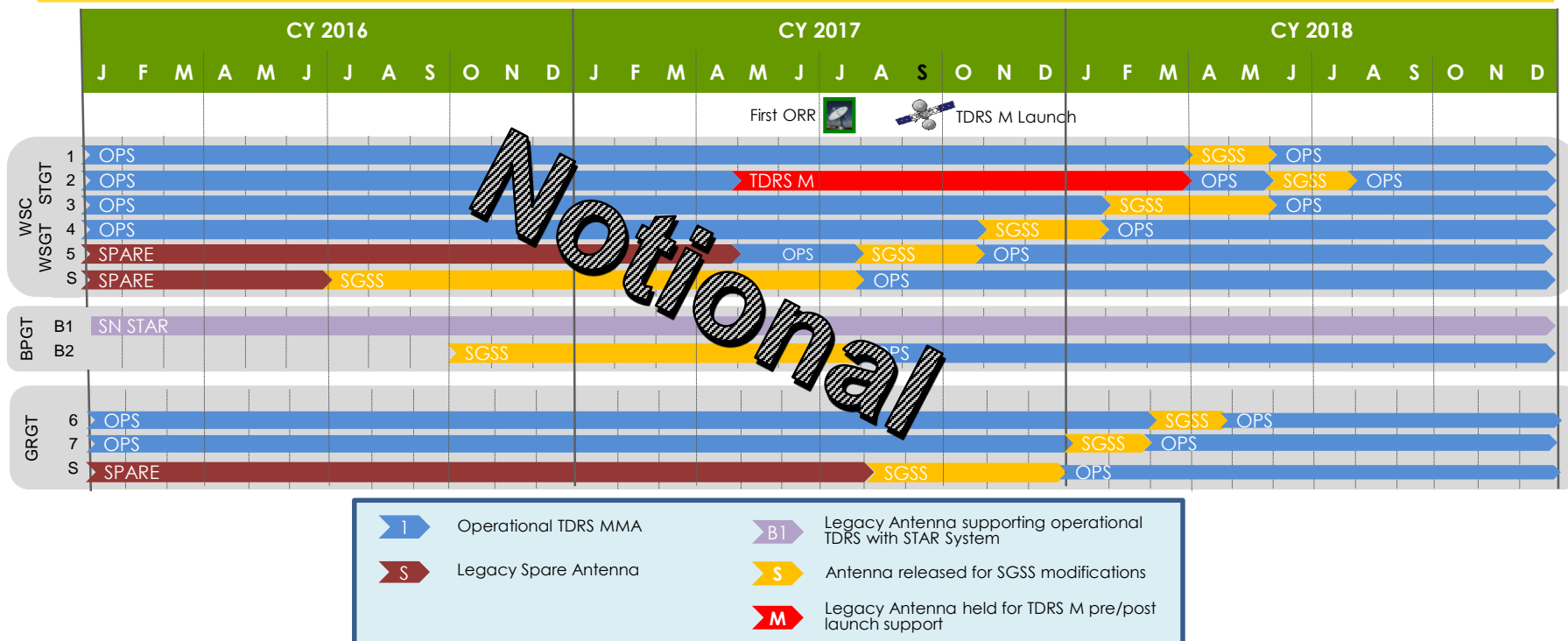


- **SGSS Removal of the Local Backup SNOC**
- **SGSS Delivery to WSGT as the first location**
 - Early Delivery WSGT South Antenna Install Begins 6/2016
 - Dry Runs Begin 11/2016
 - SW Update (M&C/Bearer) projected for 1/2017
 - Formal L5 L6 Testing Begins 2/2017
 - Training Windows begin 1/2017 and run through 1/2018
- **Key Dates**
 - MOR – 8/2016
 - First TRR – 2/2017
 - Initial ORR (WSGT 1 MMA, 2 EET ants, MTF, 1 STTC at ETGT) – 7/2017
 - TDRS M Launch – 11/2017



2016 - 2018 WSC Deployment Schedule

Notional plan with a Sept 2017 TDRS M Launch



Goals

- Maintain TDRS-M on STGT SGLT-2
 - Maintain identical configuration used for TDRS K&L while training new launch crew
- BPGT-2 remains dedicated as 12° TDRS backup
 - Ensures services for BPGT customer and avoids transition to DSN/Madrid in the event of BPGT 1 failure

Constraints

- SN needs 4 operational MMAs –
 - 2 for Atlantic Region & 2 for Pacific Region
- SGSS needs 2 antennas concurrently –
 - 1 for installation and 1 for testing
- TDRS M needs 1 antenna –
 - 4 months for pre launch and 6 months for post launch



Customer Transition and Validation Management (CTVM)



- **CTVM (Non- SPM, Dave Miller/ SPM, Andrew Ortner)**

- The CTVM will serve as SGSS POC for all SPM and non-SPM Space Network customers
- The CTVM will develop a SGSS/Customer ICD for each SN customer
 - The CTVM will be book manager for the set of ICDs
 - First Draft ICD for SGSS has been developed and is now under internal SGSS review
- Serves as primary interface for transition addendums- Interface Specific MO-01 Transition Plan(s)

- **Set of SGSS/Customer ICDs**

- Each ICD document will introduce customer to SGSS implementation from the perspective of their specific mission
- Each ICD will describe SGSS architecture elements to customer starting with legacy WSC architecture terms the customer now uses
 - For example: “DIS” changes to “USG”, “NCCDS” changes to “SM”, etc
- Each ICD will state changes/impacts to the individual customer in the SGSS era
 - Transition will be mostly transparent from customer perspective except for items like IP and FTP addressing/targets that ICD will document
 - Current legacy SSCs and legacy Scheduling systems can still be used with SGSS
- Each ICD will capture any legacy “undocumented” HW/Network behaviors for each customer
- As SGSS/Customer ICD Book Manager and SGSS POC for customers, the SGSS CTVM will contact each customer for ICD input/review support during development of ICDs during 2015



Agenda



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- **Wrap-Up**



Wrap-Up



- Targeting 1st Quarter 2016 for the next Customer TIM
- Please take a moment to provide feedback on this Customer TIM and complete our upcoming survey

Discipline	Contact	Phone
Customer Interfaces	Vir Thanvi – vir.thanvi@nasa.gov	301-286-2164
	Tim Bensch – timothy.a.bensch@nasa.gov	301-286-8882
Early Testing	Jim Clapsadle – james.e.clapsadle@nasa.gov	301-286-5111
	Nicole Loomis – nicole.loomis@nasa.gov	201-286-5428
Deployment and Transition	Richard Von Wolff – richard.l.vonwolff@nasa.gov	575-527-7036
	Gus Cuellar – augustine.cuellar@nasa.gov	575-527-7276

Thanks !!



Backup

(For Scheduling Interfaces)



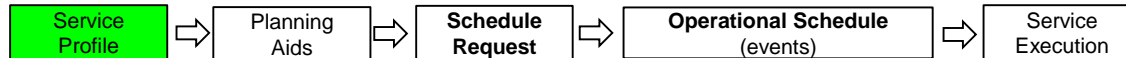
SGSS HMI Overview



- **Same overall scheduling process as used with the legacy system**
- **SGSS implements new scheduling interfaces and protocols providing the customer additional flexibility for managing and controlling services and the new SGSS service features.**
 - SGSS https Web Portal HMI
 - SGSS https MMI
 - Requests accepted 3 months in advance
- **SGSS Service Management & Control interfaces provides the following functionality to the customer:**
 - User and TDRS Vector Management and Control
 - Service Management
 - Service Monitor and Control
 - Service Accounting



Service Profile (SSC equivalent)



- **Service Specification Code (SSC) ID** provides method to map service request to pre-defined service parameters in the NCCDS (e.g., transmit frequency, data rate, channel configuration, user interface channel).
 - Provides space –to-space, space-to-ground, and ground -to-ground processing attributes.
- Similarly, in SGSS a **Service Profile Name** will be used to map service request to pre-defined service parameters in Service Management (SM).
 - Will contain two parts: Space Communication Profile and Transfer Service Profile.

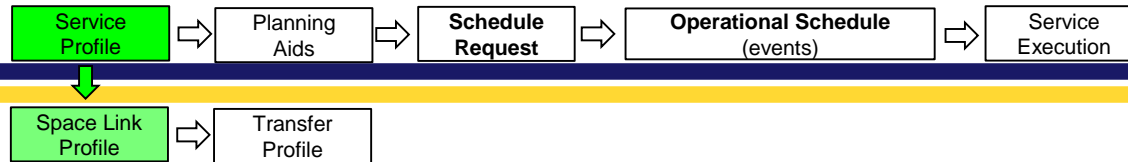
User MOC personnel can view and request edits to existing profiles

SN personnel manages/coordinates approval of new profiles and decommission of old profiles

Search									
View ▾									
New Edit Mark Not Valid Export Print									
Service Profile Name	Service Type	Approved	Approved On Date/Time	Valid Until Date/Time	External ID	Created By	Creation Date/Time	Modified	
Command	Command	Approved	2014-10-23 14:53:02	9999-12-31 16:59:59		TEST_DATA_LOA	2014-10-31 10:42:14	TEST_DA	▲
CommandRemote	CommandRemote	Approved	2014-10-23 14:53:02	9999-12-31 16:59:59		TEST_DATA_LOA	2014-10-31 10:42:14	TEST_DA	
DownlinkKu	DownlinkKu	Approved	2014-10-23 14:53:02	9999-12-31 16:59:59		TEST_DATA_LOA	2014-10-31 10:42:14	TEST_DA	
DownlinkTTCS	DownlinkTTCS	Approved	2014-10-23 14:53:02	9999-12-31 16:59:59		TEST_DATA_LOA	2014-10-31 10:42:14	TEST_DA	
GroundCmdEcho	GroundCmdEcho	Approved	2014-10-23 14:53:02	9999-12-31 16:59:59		TEST_DATA_LOA	2014-10-31 10:42:14	TEST_DA	
TDRSTrackingRanging	TDRSTrackingRanging	Approved	2014-10-23 14:53:02	9999-12-31 16:59:59		TEST_DATA_LOA	2014-10-31 10:42:14	TEST_DA	
Telemetry	Telemetry	Approved	2014-10-23 14:53:02	9999-12-31 16:59:59		TEST_DATA_LOA	2014-10-31 10:42:14	TEST_DA	
TelemetryRemote	TelemetryRemote	Approved	2014-10-23 14:53:02	9999-12-31 16:59:59		TEST_DATA_LOA	2014-10-31 10:42:14	TEST_DA	
UplinkRFLoopCommandEcho	UplinkRFLoopCommandEcho	Approved	2014-10-23 14:53:02	9999-12-31 16:59:59		TEST_DATA_LOA	2014-10-31 10:42:14	TEST_DA	
UplinkKu	UplinkKu	Approved	2014-10-23 14:53:02	9999-12-31 16:59:59		TEST_DATA_LOA	2014-10-31 10:42:14	TEST_DA	
UplinkTTCS	UplinkTTCS	Approved	2014-10-23 14:53:02	9999-12-31 16:59:59		TEST_DATA_LOA	2014-10-31 10:42:14	TEST_DA	



Service Profile Create: Space Link



- Space Communication Profile will be similar to SSC parameters but include additional service attributes new to SGSS (e.g., higher data rates, additional modulations)

Service Profile Name: ReturnKuSA
Service Profile Type: ReturnKuSA
Approval: ☒ Approved ☐ Not Approved
Approved On Date/Time: 2014-236 14:55:02
Valid Until Date/Time: 9999-12-31 16:59:59
New Comment:
External Id:

Antenna Polarization: rhcp
Antenna Control Mode: openLoop
Nominal Frequency: 15003403670
Acquisition Search BW at Service Start: Nominal
Nominal Acquisition Search Bandwidth: 5000
Expanded Acquisition Search Bandwidth: 20000
Acquisition Threshold Min Eb/No: 6
Acquisition Threshold Min EIRP: 30
Modulation Type: sqpn
IQ Power Ratio: 0
PM Modulation Index: 0
PM Modulation Index: 0.2
Subcarrier Frequency: 160000
Subcarrier: sineWave
PN Code In Library: ☐ No-Manually Specify ☒ Library
PN Code Agency: nasa
PN Code Number: 1
Register A I: 000000
Register C Q: 000000
Feedback Taps: 00000000
PN Mode: dg1Mode2
PN Coherent: ☐ Disabled ☒ Enabled
PN Chip Rate: 2500000
Convolutional Coding: ☒ Disabled ☐ Enabled
Coding Rate I: 1/2
Coding Rate IQ: 1/2

Range: All
Range: All
Min (Hz): 15002638000
Max (Hz): 15004162000
Range: All
Min (Hz): 5000
Max (Hz): 55000
Min (Hz): 20000
Max (Hz): 55000
Min: -10
Max: 100
Min (dBW): -99
Max (dBW): 99
Range: All
Min (dB): -6
Max (dB): 0
Min (radians): 0
Max (radians): 3.15
Min (radians): 1.57
Max (Hz): 2048000
Min: 1
Max: 85
Range dg1Mode2
Min (cps): 2500000
Max (cps): 3600000
Range: All
Range: All

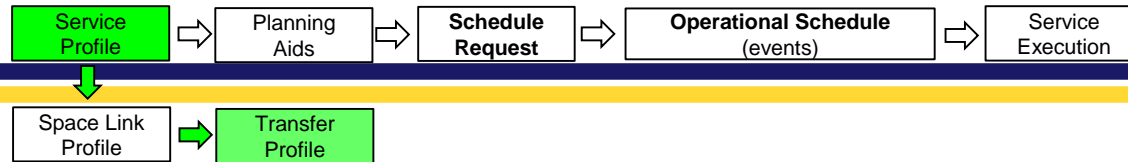
Profile parameter values checked against Service Agreement

Error
Messages for this page are listed below.
Register A I ☒ Format Failed
Data Rate Ch1 (bps) ☒ You must enter a value.

Submit Cancel



Service Profile Create: Forward Transfer



- Today, ground-to-ground is limited to identification of serial local interface port or destination to NISN device
- Transfer Service Profile will contain not just ground data distribution parameters but also contain ground processing configurations similar to what is currently being supported by Customer's ULE (e.g., encapsulation, frame processing).
 - Moving over to the new SGSS interface will allow MOCs to specify and reconfigure in the request the data transfer over the new SGSS interfaces
 - Remaining with the legacy scheduling interface will allow MOCs to "reference" a pre-defined transfer configuration for the new SGSS data interface based on a pre-defined mapping between the legacy SSC and the SGSS Service Transfer Profile.

Service Profile Name:

Service Profile Type: **ForwardBasebandIP**

Approval: ☐ Approved ☒ Not Approved

New Comment:

External Id:

Approved On Date/Time:

Valid Until Date/Time:

Previous Comments:

BB Packetized ULE Ch1

BB Serial ULE Ch1

Payload Type

Connection Initiation Time

Bit Rate Adaptation

Encapsulation Protocol

Preferred LAN Baseband Net

Input or Select the payload data type received from the Baseband Source.

Range All

Min (sec) 0

Max (sec) 1000

Input or Select the data encapsulation protocol received from the Baseband Source.

USG.

serial
packetized
nascom4800Bb
leoT
ipdu
none
sle
ipOverAos

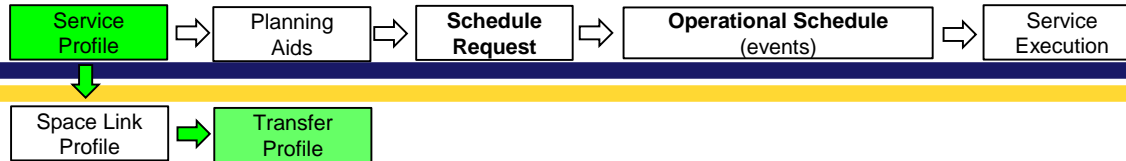
bitstream
nonCcstds
ccstdsTm
ccstdsAos
ccstdsTc
cltu
cadu
ipOverAos

Range All

Range ☒ All ☒ serial ☒ packetized ☒ nascom4800Bb ☒ leoT ☒ ipdu ☒ none ☒ sle ☒ ipOverAos



Service Profile Create: Return Transfer



Service Profile Name:

Service Profile Type: **ReturnBasebandIP**

Approval: ☐ Approved ☒ Not Approved

Approved On Date/Time:

Valid Until Date/Time:

Previous Comments:

New Comment:

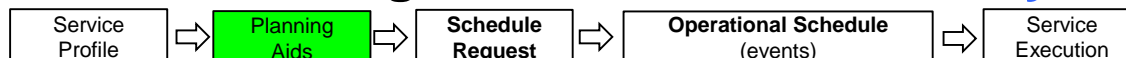
External Id:

- Profile parameter values checked against Service Agreement
- Parameter values can be re-specified if using SGSS Request HMI/MMI

Parameter	Value	Min (bps)	Max (bps)
Data Rate Ch1	100	100	1500000000
Max Data Rate Ch1	100	100	1500000000
Data Rate Ch2	100	100	1500000000
Max Data Rate Ch2	100	100	1500000000
Preferred LAN Baseband Net	<input type="text"/>	Range All	
Encapsulation Protocol Type Ch1	<input type="text"/>	Range All	
Encapsulation Protocol Type Ch1	<input type="text"/>	Range All	
Dual Source Ch1	<input checked="" type="radio"/> Disabled <input type="radio"/> Enabled		
Slew Rate Limit Ch1	3800	Min 3800	Max 65535
Fast Acquisition Output Ch1	<input checked="" type="radio"/> Not inhibit <input type="radio"/> Inhibit		
Encapsulation Protocol Type Ch2	<input type="text"/>	Range All	
Slew Rate Limit Ch2	3800	Min 3800	Max 65535
Fast Acquisition Output Inhibit Ch2	<input checked="" type="radio"/> Not inhibit <input type="radio"/> Inhibit		
Connection Initiation Time	0	Min (sec) 0	Max (sec) 1000
BB Packetized ULE Ch1	<input type="text"/>		
BB Serial ULE Ch1	<input type="text"/>		
BB Serial ULE Ch1 Dualsink	<input type="text"/>		
BB Packetized ULE Ch2	<input type="text"/>		
BB Serial ULE Ch2	<input type="text"/>		



Planning Aids: Time Period Query



- SGSS HMI allows the user to query view period products available in the system for their mission or any other mission as allowed by the service agreements.

Time Periods

☒ Search Time Periods

 Basic | Saved Search Implicit Search

Match ☒ All ☐ Any

Group Name Contains Group

Platform 1 Equals

Platform 2 Equals

Source Equals

Start Date/Time After

End Date/Time On or before

Mission Profile Starts with

Modified By Starts with

Modified Date/Time Equals

Created By Starts with

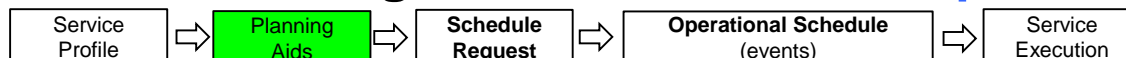
Created Date/Time Equals

Search Revert Save... Add Fields

Group Name	Platform 1	Platform 2	Source	Start Date/Time	End Date/Time	Mission Profile	Modified By	Created By	Modified Date/Time
Group 1b	TDRS 7/G	ETGT STTC Ant 2	HMI	2014-05-04 12:23:00	2014-05-04 12:53:00		SV_PSS_DB	SV_PSS_DB	2014-03-18 19:20:39
Group Z	TDRS 7/G	TDRS 11/K SA2	HMI	2014-06-06 14:39:00	2014-06-16 14:39:00		SV_PSS_DB	SV_PSS_DB	2014-03-18 19:03:02
Group Z	TDRS 9/I MA	TDRS 11/K SA2	HMI	2014-07-04 00:00:00	2014-07-24 00:00:00		SV_PSS_DB	SV_PSS_DB	2014-03-18 19:04:40
Group 12	TDRS 7/G	NEN Wallops	HMI	2014-08-03 07:21:00	2014-08-03 08:21:00		SV_PSS_DB	SV_PSS_DB	2014-03-18 19:13:31
GroupV	TDRS 5/E	WSGT STTC Ant 1	HMI	2014-09-04 19:22:00	2014-10-04 19:22:00		SV_PSS_DB	SV_PSS_DB	2014-03-18 19:12:27
Group 1a	TDRS 10/J SGL	NEN South Point Ant 1	HMI	2014-12-04 14:00:00	2014-12-05 14:00:00		SV_PSS_DB	SV_PSS_DB	2014-03-18 18:55:42
Group33	TDRS 6/F SA1	ATF Ant 1	ABC	2015-05-05 15:00:07	2015-05-06 15:00:07		SV_PSS_DB	SV_PSS_DB	2014-03-18 19:01:55
Group 12	TDRS 9/I SA1	NEN Santiago	HMI	2015-07-04 12:23:00	2015-07-04 12:33:00		SV_PSS_DB	SV_PSS_DB	2014-03-18 19:17:21
Group 4	TDRS 10/J MA	TDRS 12/L SA2-EFOV	HMI	2015-11-12 14:22:00	2015-12-02 14:22:00		SV_PSS_DB	SV_PSS_DB	2014-03-18 19:09:43
GroupV	TDRS 5/E	TDRS 6/F	HMI	2022-01-02 19:11:00	2022-01-03 19:11:00		SV_PSS_DB	SV_PSS_DB	2014-03-19 20:37:47
Group 12	TDRS 9/I MA	BRTS GW1J (Guam)	HMI	2044-12-15 08:00:01	2044-12-15 08:00:01		SV_PSS_DB	SV_PSS_DB	2014-03-19 23:01:02



Planning Aids: Time Period Import



- SGSS HMI allows the definition and import of planning aids, such as TSW, that can be referenced in service request in place of absolute service times
- Alternatively, Users can submit vector data via the SGSS HMI and SGSS will generate time view periods from user platforms to TDRS

Time Periods

☒ Search Time Periods

Match ☒ All ☐ Any

Group Name

Platform 1

Platform 2

Source

Start Date/Time

End Date/Time

Mission Profile

Import Planning Aids File

File Type **TSW**

File to import

Time Period Group

View

Group Name	Platform 1
A# - Orbit Point Anomaly	
B# - Orbit Point Anomaly	
C# - Orbit Point Anomaly	
D# - Orbit Point Anomaly	
E# - Orbit Point Anomaly	
F# - Orbit Point Anomaly	
G# - Orbit Point Anomaly	
H# - Orbit Point Anomaly	
I# - Orbit Point Anomaly	
J# - Orbit Point Anomaly	

Columns Hidden 1

File Upload

places projects TimePeriod TimePeriodHMI **TimePeriodHMITest**

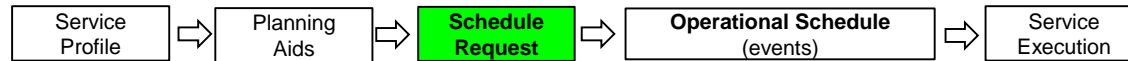
Name	Size	Modified
classes		08.16
public_html		Yesterday at 23:09
src		Yesterday at 23:09
build_jdev.properties	241 bytes	Yesterday at 23:09
build_jdev.xml	9.5 KB	Yesterday at 23:09
example-psat.dat	622.8 KB	Yesterday at 23:09
example-tcw.txt	33.7 KB	Yesterday at 23:09
example-tsw-1.txt	1.9 KB	Yesterday at 23:09
example-uav.dat	106.0 KB	Yesterday at 23:09
TimePeriodHMITest.jpg	23.4 KB	Yesterday at 23:09

Time	Created By
08:04	SNOC
08:04	SNOC
08:04	SNOC
08:04	SNOC
08:04	SNOC
08:04	SNOC
08:04	SNOC
08:04	SNOC
08:04	SNOC
08:04	SNOC

Time **Created By**



Schedule Request



- SGSS HMI accepts requests up to 3 months in advance of the requested service start
- SGSS HMI allows users to query for request in the system based on a user specified filter criteria
- SGSS HMI allows users to create, edit and delete schedule requests.

Search

Match: ☒ All ☐ Any

Schedule Request ID: Latest End Date/Time:

Request State: TDRS:

Absolute Priority Name: TDRS Antenna:

Event Name: Ground Antenna:

Scheduled Event ID(s): User Platforms:

Mission Profile Name: Created By:

Service Profiles: Created Date/Time:

Service Types: Modified By:

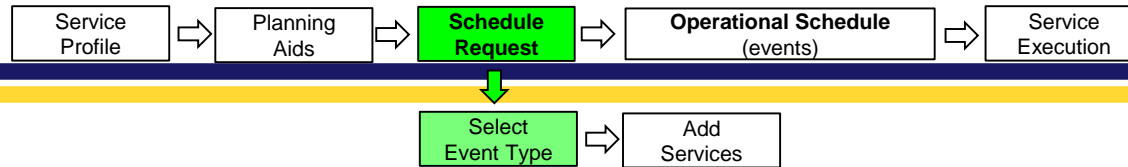
Earliest Start Date/Time: Modified Date/Time:

View: New Edit Delete Export Print

Schedule Request ID	Request State	Absolute Priority Name	Event Name	Scheduled Event ID(s)	Mission Profile Name	Earliest Start Date/Time	Latest End Date/Time	TDRS	TDRS Antenna	Ground Antenna	User Platform
3400020150	NEW	Emerg-HSF-Flight	Uplink Downlink Ku Event			2014:349 22:58:37	2014:349 23:01:37	TDRS-1		STGT MM Ant 1 (North)	
3400020152	NEW	Emerg-HSF-Flight	MA Calibration Event			2014:349 22:58:41	2014:349 23:01:41	TDRS-1		STGT MM Ant 1 (North)	
3400020151	NEW	Emerg-HSF-Flight	User Event		ABC Mission	2014:349 22:58:38	2014:349 23:01:38	TDRS-1		STGT MM Ant 1 (North)	
3400020153	NEW	Emerg-HSF-Flight	Uplink/Downlink S Event			2014:349 22:58:42	2014:349 23:01:42	TDRS-1		STGT MM Ant 1 (North)	
3400020164	NEW	Emerg-HSF-Flight	User Event		ABC Mission	2014:349 22:59:12	2014:349 23:02:12				
3400020172	NEW	Emerg-HSF-Flight	MA Calibration Event			2014:349 22:59:32	2014:349 23:02:32	TDRS-1		STGT MM Ant 1 (North)	
3400020173	NEW	Emerg-HSF-Flight	Uplink/Downlink S Event			2014:349 22:59:32	2014:349 23:02:32	TDRS-1		STGT MM Ant 1 (North)	
3400020174	NEW	Emerg-HSF-Flight	User Event		ABC Mission	2014:349 22:59:33	2014:349 23:02:33				
3400020180	NEW	Emerg-HSF-Flight	Uplink Downlink Ku Event			2014:349 22:59:46	2014:349 23:02:46	TDRS-1		STGT MM Ant 1 (North)	
3400020181	NEW	Emerg-HSF-Flight	User Event		ABC Mission	2014:349 22:59:47	2014:349 23:02:47	TDRS-1		STGT MM Ant 1 (North)	
3400020182	NEW	Emerg-HSF-Flight	MA Calibration Event			2014:349 22:59:50	2014:349 23:02:50	TDRS-1		STGT MM Ant 1 (North)	
3400020183	NEW	Emerg-HSF-Flight	Uplink/Downlink S Event			2014:349 22:59:50	2014:349 23:02:50	TDRS-1		STGT MM Ant 1 (North)	
3400020184	NEW	Emerg-HSF-Flight	User Event		ABC Mission	2014:349 22:59:51	2014:349 23:02:51				
3400020200	NEW	Emerg-HSF-Flight	Uplink Downlink Ku Event			2014:349 23:00:27	2014:349 23:03:27	TDRS-1		STGT MM Ant 1 (North)	
3400020201	NEW	Emerg-HSF-Flight	User Event		ABC Mission	2014:349 23:00:27	2014:349 23:03:27	TDRS-1		STGT MM Ant 1 (North)	
3400020202	NEW	Emerg-HSF-Flight	MA Calibration Event			2014:349 23:00:30	2014:349 23:03:30	TDRS-1		STGT MM Ant 1 (North)	
3400020203	NEW	Emerg-HSF-Flight	Uplink/Downlink S Event			2014:349 23:00:31	2014:349 23:03:31	TDRS-1		STGT MM Ant 1 (North)	



Schedule Request Create: Select Event Type



- Creating a schedule request requires the MOC to select an event type or a predefined event template
- Next, MOC adds the necessary services to the event, or if a template is selected then services from the template will already be added.

Event Details

Schedule Request ID:

Event Name:

Absolute Priority:

Moveable: ☒ Yes ☐ No

Freeze Interval: d:h:m:s

Event Definition:

TDRS Platform:

User Platform:

Customer Priority:

Start Time Constraint: * Type:

Start Date/Time (UTC): *

Tolerances: * Lead: d:h:m:s * Lag: d:h:m:s

Scheduling Constraints:

Time Windows:

Service Details

Select New... to add a new Service, or select and click Edit to reconfigure an existing Service ...

Configured Services:

Data Service Profile	Transfer Service Profile	Time Constraint Type
<input type="text" value="List services included in event"/>		

Submit Cancel

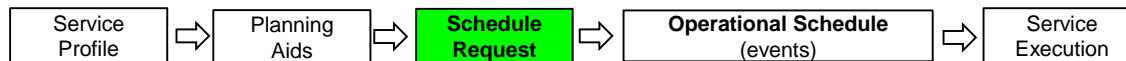
Select a Service Type

Service Type:

OK Cancel



Schedule Request Create: Re-specifying Service Parameters



Service Details - Mozilla Firefox

Service Details

* Start (UTC) []

* End (UTC) []

Service Type DownlinkKu

Data Svc Profile DownlinkKu

DownlinkKu - DownlinkKu

* No. of Subservices 2

Beamformer Telemetry Frequency K-Common

Antenna Control Mode Ku Autotrack

* Autotrack Threshold 32

Signal Source Downlink From antenna

Autotrack Telemetry Frequency K-Common

Downlink Polarization Horizontal

Auto LNA Switch Failover ☐ Disabled ☒ Enabled

Schedulable Resources

KuRx Composite StgtMma1KuRxComposite

Service Profile filled in with defaults

Library

* Register A I 123

* Register C Q 0o0000

PN Mode DG1 Mode 2

PN Coherent ☐ Disabled ☒ Enabled

Convolutional Coding ☒ Disabled ☐ Enabled

Symbol Processing I ar

Symbol Format I NR

Data Format I NR

Data Format Q NR

Convolutional Coding Q ☒ Disabled ☐ Enabled

Symbol Format Q NRZL

Payload Type Ch1 bitstream

Payload Type Ch2 bitstream

Collection of Tracking ☒ False ☐ True

r Tracking Bandwidth (Hz) 3000.0

ources

Tdrs1SA1KuR

urnBasebandIP

ebandSink - ReturnBasebandIP

ata Rate Ch1 (bps) []

ata Rate Ch1 (bps) 1000

Allow re-specification of parameters, validated per Service Agreement

Error

Messages for this page are listed below.

Register A I ☒ Format Failed

Data Rate Ch1 (bps) ☒ You must enter a value.

Service Details - Mozilla Firefox

Service Details

* Start (UTC) 2014:08:27 22:42:33

* End (UTC) 2014:08:28 22:42:36

Service Type ReturnKuSA-BasebandSink

Data Svc Profile ReturnKuSA

ReturnKuSA-BasebandSink - ReturnKuSA

Antenna Polarization RHCP

Antenna Control Mode Program Track

* Nominal Frequency (Hz) 15003403670

Acquisition Search BW at Service Start Nominal

* Nominal Acquisition Search Bandwidth (Hz) 5000

Acquisition Threshold Min Eb/No []

* Acquisition Threshold Min EIRP (dBW) 30

Modulation Type SS QPSK

* IQ Power Ratio (dB) 0

Create Service Confirmation

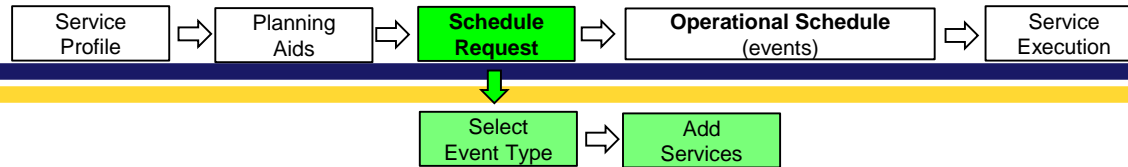
Are you sure you want to add the service? The event still needs to be submitted on the Event Details page in order to submit the service.
WARNING: TDRS is not available for the selected service start and end times.

OK Cancel

Confirm creation of service



Schedule Request Create: Event and Service Flexibilities



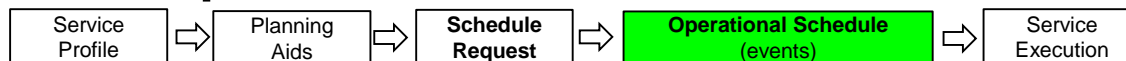
- Various flexibilities to specify desired service time or recurring times

The screenshot shows the 'Parameters & Resources' form for creating a schedule request. The form is divided into several sections:

- Time Constraint:** * Type: Simple (dropdown). Duration: * Minimum: 25:00:00:00 d:h:m:s. Preferred: 50:00:00:00 d:h:m:s.
- Time Windows:** (checked).
 - Simple:** (highlighted with a red box).
 - Absolute Date/Time (UTC): * Start: 2014-12-02 20:35:17. * End: (empty field).
 - Inclusion Type: ☒ Inclusive (within this Time Window). ☐ Exclusive (not within this Time Window).
 - Buttons: Add, Update, Cancel.
 - Period:** (highlighted with a red box).
 - Entry of Time Period Time Windows is disabled, because no Time Period Groups are available.
 - Buttons: Add, Update, Cancel.
- Weekly:** (highlighted with a red box).
 - Day of Week: (dropdown).
 - Time of Day (UTC): Start: (empty field) h:m:s. End: (empty field) h:m:s.
 - Inclusion Type: ☒ Inclusive (within this Time Window). ☐ Exclusive (not within this Time Window).
 - Buttons: Add, Update, Cancel.



Operational Schedule: List of Events



- Operational schedule will display events relevant to each mission. E.g. ISS can view their scheduled events as well as those of a visiting vehicle .

Gantt chart overview of schedule events



Detail view of schedule events

Search

Match ☐ All ☒ Any

Event ID Equals User Platform Event Start Greater Than

Event State Event Definition Event End Less Than

Mission Profile Service Definition

TDRS Service Profile

Ground Antenna Owner Contains

View Sort By None Descending New... View Delete

Event ID	Event State	Mission Profile	TDRS	Ground Antenna	User Platform	Owner	Event Start	Event End	Event De
850020014	SCHEDULED		TDRS-4	STGT MM Ant 1 (North)	TCW UserPlat (SIC 1446)	EventOwner1	2014:321 17:34:02	2014:321 18:07:42	Uplink Do
850020015	SCHEDULED		TDRS-4	STGT MM Ant 1 (North)	TCW UserPlat (SIC 1446)	EventOwner1	2014:321 17:42:28	2014:321 18:16:08	Uplink Do
850020008	SCHEDULED		TDRS-4	STGT MM Ant 1 (North)	TCW UserPlat (SIC 1446)	EventOwner1	2014:321 17:29:26	2014:321 17:39:47	Uplink Do
850020011	SCHEDULED		TDRS-4	STGT MM Ant 1 (North)	TCW UserPlat (SIC 1446)	EventOwner1	2014:321 17:39:26	2014:321 17:49:46	Uplink Do
850020012	SCHEDULED		TDRS-4	STGT MM Ant 1 (North)	TCW UserPlat (SIC 1446)	EventOwner1	2014:321 17:41:42	2014:321 17:52:02	Uplink Do

Search Saved Search Basic Link Do

Detail view of schedules Services

Search

Match ☐ All ☒ Any

Service ID Equals TDRS Start Greater Than

Event ID Equals Ground Antenna End Less Than

Service State User Platform Post-Service End Less Than

Service Definition Event Definition

Service Profiles Pre-Service Start Greater Than

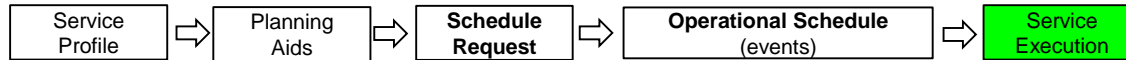
View Sort By None Descending

Service ID	Event Id	Service State	Service Profiles	TDRS	Ground Antenna	User Platform	Pre-Service Start	Start	End	Post-Service End	Service De
850020012	850020014			TDRS-4	STGT MM Ant 1 (North)	TCW UserPlat (SIC 1446)	2014:321 17:34:02	2014:321 17:34:12	2014:321 17:24:12	2014:321 18:07:42	UplinkKu
850020014	850020015			TDRS-4	STGT MM Ant 1 (North)	TCW UserPlat (SIC 1446)	2014:321 18:04:05	2014:321 18:04:15	2014:321 18:14:15	2014:321 18:14:25	UplinkKu
850020015	850020015			TDRS-4	STGT MM Ant 1 (North)	TCW UserPlat (SIC 1446)	2014:321 17:42:28	2014:321 17:42:38	2014:321 17:32:38	2014:321 18:16:08	UplinkKu
850020018	850020018			TDRS-4	STGT MM Ant 1 (North)	TCW UserPlat (SIC 1446)	2015:321 21:29:16	2015:321 21:29:26	2015:328 21:29:26	2015:328 21:29:36	UplinkKu

Search



Service Execution



- SGSS Service Execution HMI provides access to all real-time monitoring and control information/functions
- HMI references Operational schedule event ID and service profile
- Multiple tabs allow for quick access to performance, control requests, resources, relationships to other services, etc.

Event-Service ID: 67890 - 12345

TDRS: TD271/TDRS-8

Start Date Time (UTC): 2014:163 22:05:05

Service State: SCHEDULED

Service Type: Command

End Date Time (UTC): 2014:227 22:04:05

Details

Configuration

Performance

Control

Directives

Relationships

Resources

Event ID: 67890

Owner:

Duration: 63 Days, 23:59:00

Service Profile: TBD

Is Return Service Recording

Is S-Band Power Combining:

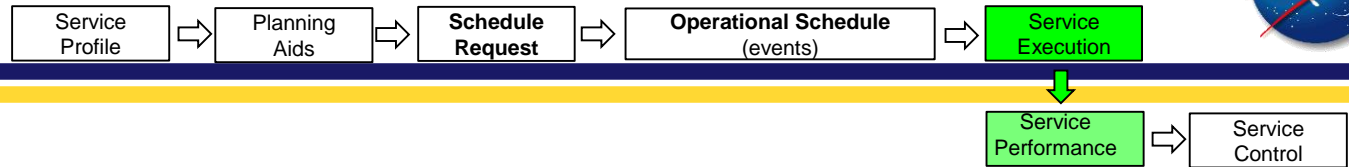
Subservice Data:

Change To Primary

Subservice ID	Subservice Role	Subservice State
38	Non-Primary	SCHEDULED
39	Non-Primary	SCHEDULED
40	Non-Primary	SCHEDULED
21	Primary	SCHEDULED
36	Non-Primary	SCHEDULED



Service Execution: Performance Status



- Each service type has service performance data displayed in functional groups.
- Status update configured by each mission but immediate update request available for the HMI for latest status
- Primary and redundant service performance status are available

Event-Service ID: 850020503 - 850020510
Service State: COMPLETED

TDRS: TDRS-1
Service Type: DownlinkKu

Start Date Time (UTC): 2014:164 02:53:33
End Date Time (UTC): 2014:164 02:55:40

Details Configuration **Performance** Control Directives Relationships Resources

Subservice: Primary

Summary

DSP Band : S-Band	ADC In Satur Status : OK	Framesync Timestamp : 2014-06-12 19:55:39.994	
DSP Grnd Term / Ant ID : W-MMA-C1	ADC In Avg Power Alarm : OK		
DSP TDRS ID : F1	TLM Fsync Listener Addr : 123.123.123.123		
DSP Downlink Pol : RHCP	Framesync UDP Port : 100		
FE Type : Dedicated_Pol	TLM Fsync Secs : 100		
AGC Attenuation : 10.0	TLM Fsync Pico Secs : 100		
ADC In Avg Power : -10.0	AT Epoch Fsync Secs : 100		
ADC In Max Power : -10.0	AT Epoch Fsync Pico Secs : 100		

Group2

1 Digital IF Name : TLM1	1 A Multicast Address : 123.123.123.123	1 B Avg Power : -10.0	1 B UDP Port : 10
1 Digital IF Freq : 100	1 A Unicast Address : 123.123.123.123	1 B Max Power : -10.0	1 B Stream ID : 10
1 A Enabled : Enabled	1 A VLAN : 10	1 B Saturation Stat : OK	1 B Digital IF Interface : A backplane 4:7
1 A Avg Power : -10.0	1 A UDP Port : 10	1 B Gain : 10.0	1 B Digital IF Format : MAR
1 A Max Power : -10.0	1 A Stream ID : 10	1 B Sent Packet Count : 100	
1 A Saturation Stat : OK	1 A Digital IF Interface : A backplane 4:7	1 B Multicast Address : 123.123.123.123	
1 A Gain : 10.0	1 A Digital IF Format : MAR	1 B Unicast Address : 123.123.123.123	
1 A Sent Packet Count : 100	1 B Enabled : Enabled	1 B VLAN : 10	

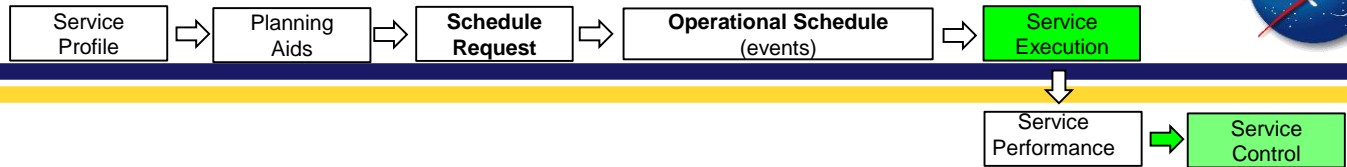
Group3

Request Status

Last Updated Time (UTC): 2014:164 02:55:40



Service Execution: Service Control



- HMI provides access to Control Directives to change configuration of the service
- Once the services are in the operational schedule Control requests can be scheduled to occur at some user specified time during the service
- Once the services are executing Control Requests can be scheduled to occur immediately or at some user specified time during the service

Open Firefox menu 7890 - 12345 TDRS: TD271/TDRS-8 Start Date Time (UTC): 2014:163 22:05:05
Service State: SCHEDULED Service Type: Command End Date Time (UTC): 2014:227 22:04:05

Details Configuration Performance **Control** Directives Relationships Resources

View ▾ Change ▾ Control ▾ Tracking ▾ Delete

Service ID:	Service Change ID:	Control Type:	Control Start Time:	State:
12345	850020100	PRIMARY_SUBSERVICE_SELECT	2014:163 22:19:35	NEW

Total Rows: 1

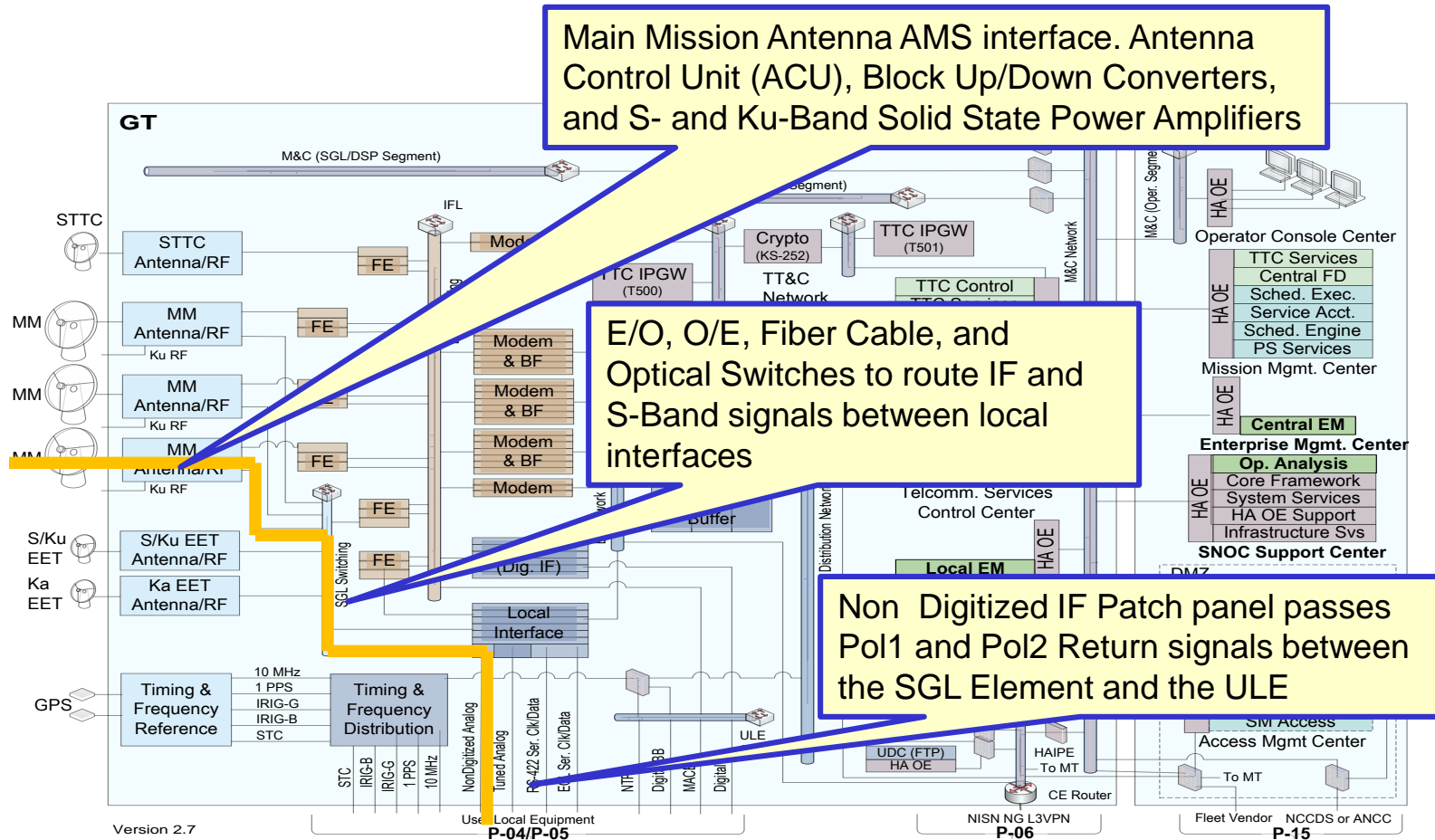
Control Type: PRIMARY_SUBSERVICE_SELECT



Backup

(For User Data Transport)

Non Digitized Analog IF



SGSS Preserves Legacy Non-Digitized Analog IF Capabilities.

Signal Acquisition and Transmission

Filter and Digitize Signal

Switch Signal Between Antenna and Resource Pool

Switch Signal Between UDC and ULE

Multicast Distribution

Bearer data logically separated in UDC by stream ID in conjunction with the class ID in VRT header field

Unicast Distribution

SGSS Adds Digital IF Capabilities that Simplify and Improve ULE Access.



MACE



Signal Acquisition and Transmission

Digitize Signal

Switch Signal Between Antenna and Resource Pool

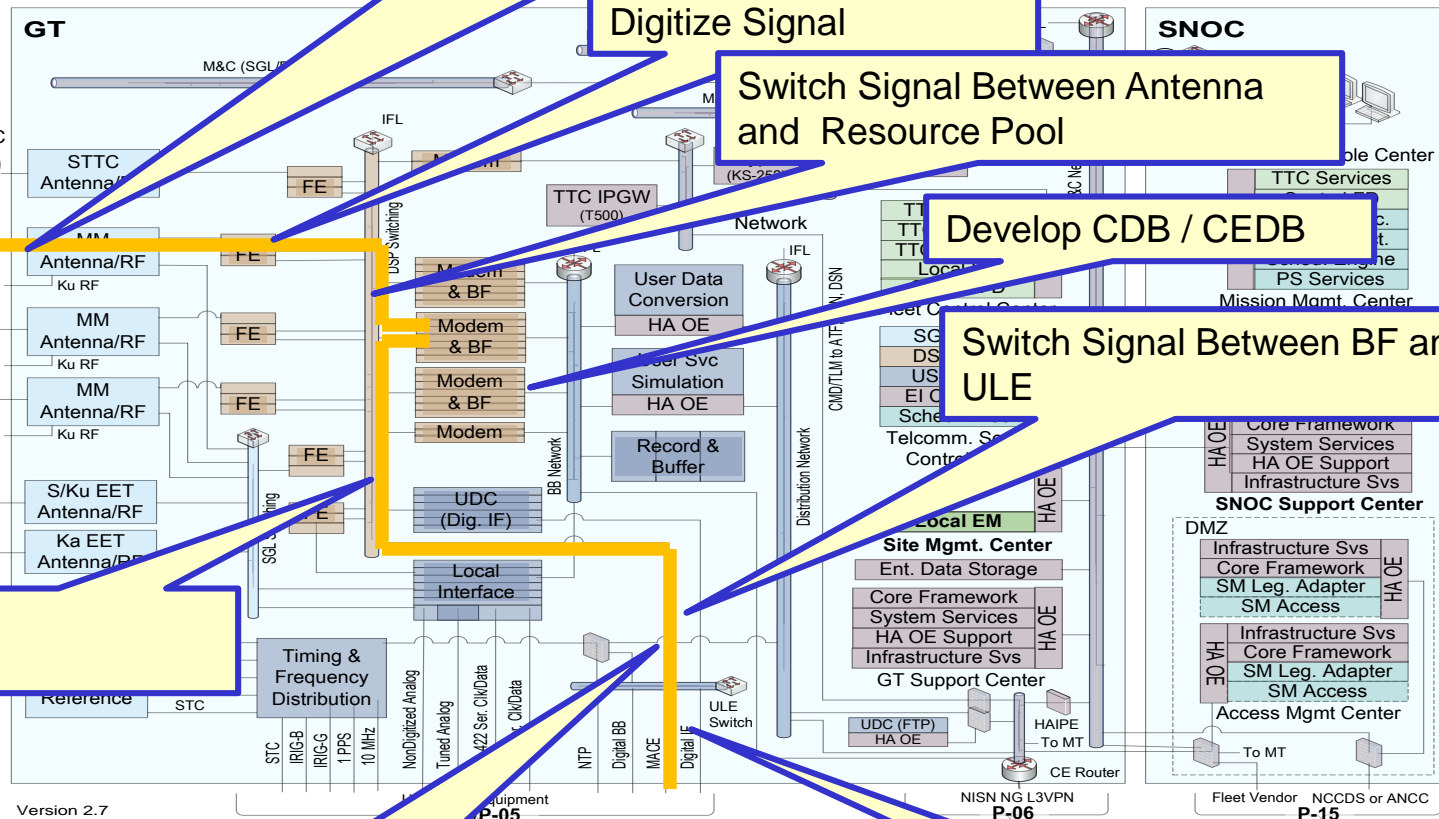
Develop CDB / CEDB

Switch Signal Between BF and ULE

Multicast Distribution

VLANs separate MACE Data on USGN

Multicast Distribution





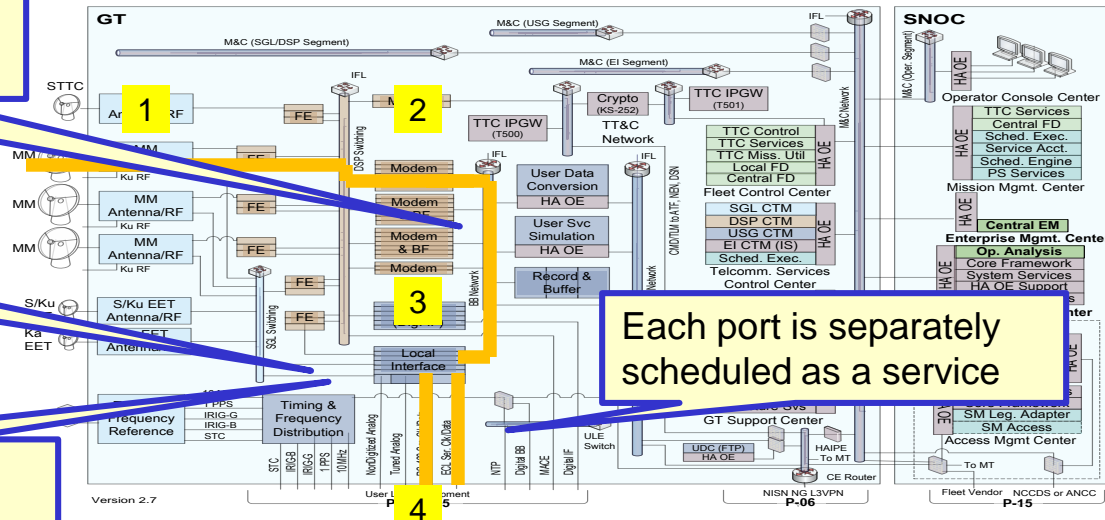
Serial Baseband ULE



VLANs separate Baseband Packet user data on USGN

Bearer data logically separated in LI by stream ID in conjunction with the class ID in VRT header

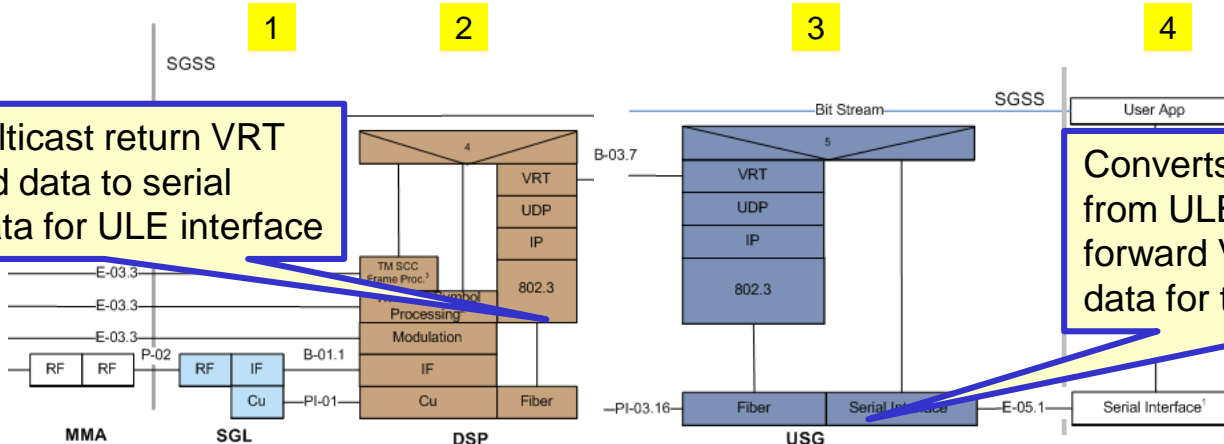
Dejitter buffers minimize network latency variation



Each port is separately scheduled as a service

Converts multicast return VRT encapsulated data to serial baseband data for ULE interface

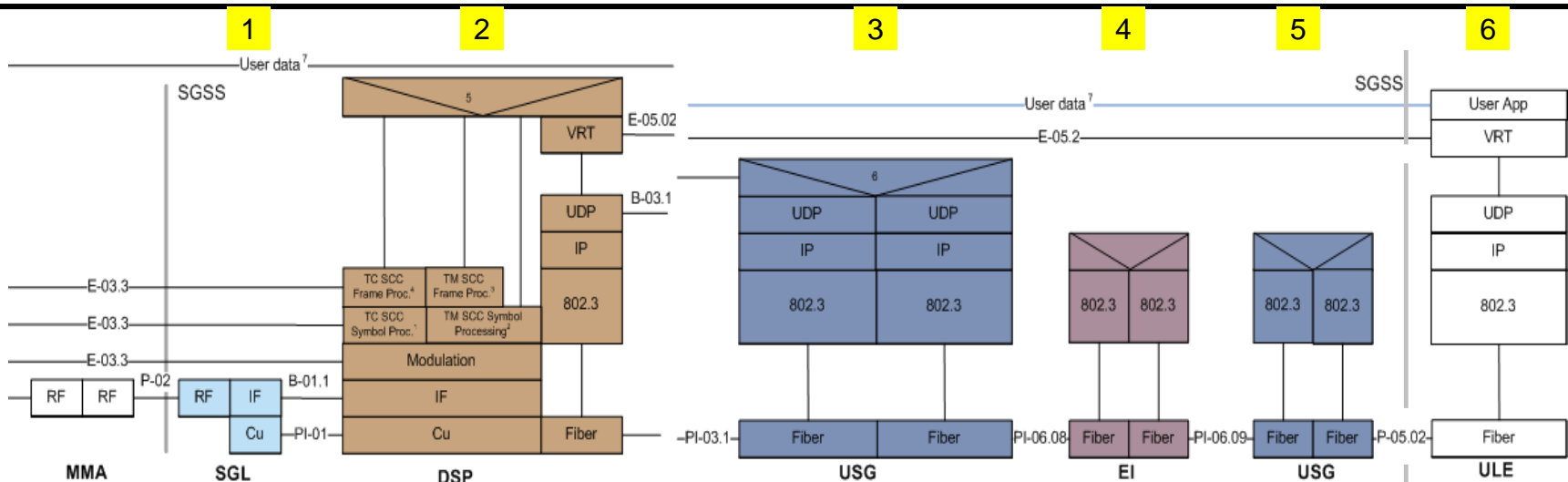
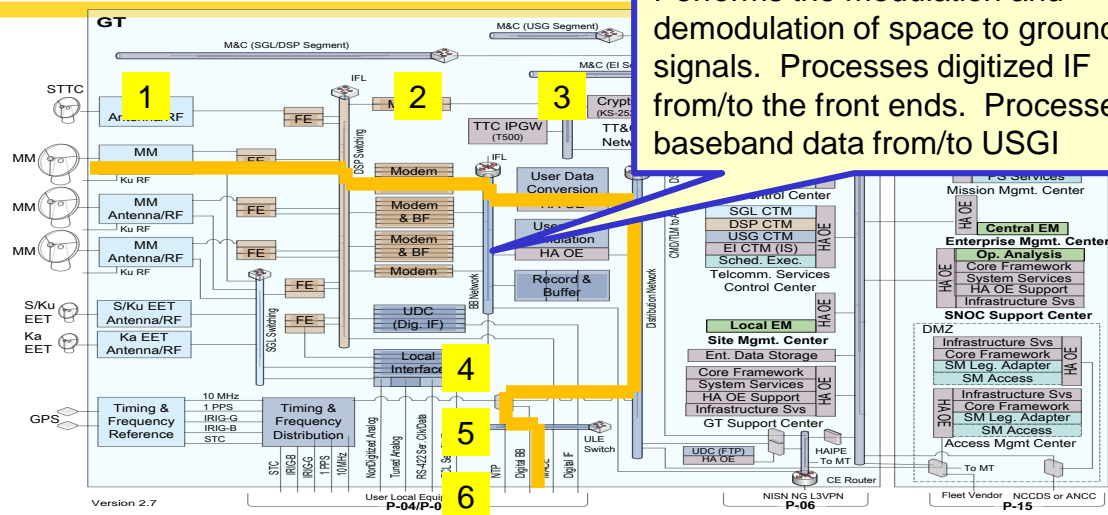
Converts serial baseband data from ULE interface to multicast forward VRT encapsulated data for the DSP Element



SGSS Preserves Legacy Serial Baseband ULE Capabilities.



Packet Baseband ULE

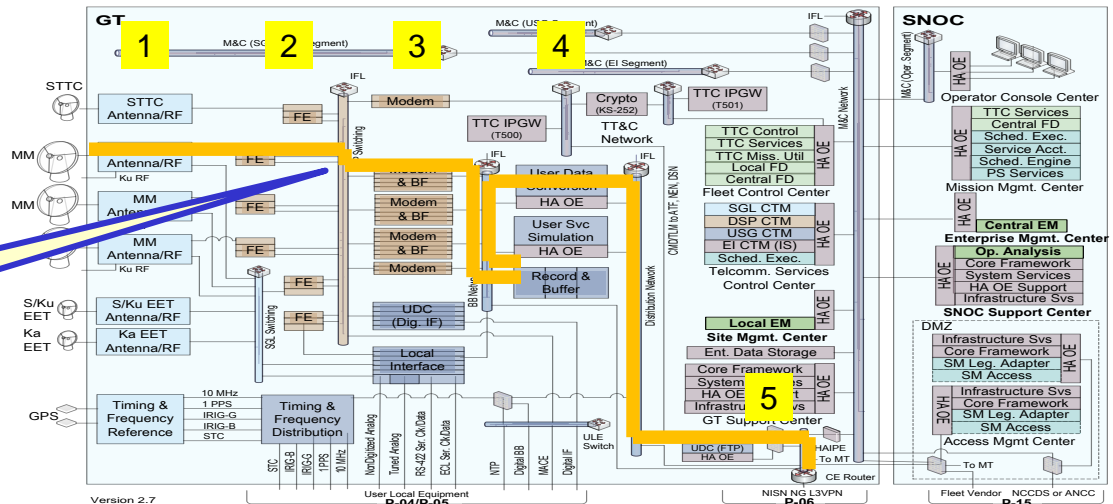




IP-over-CCSDS User MOC

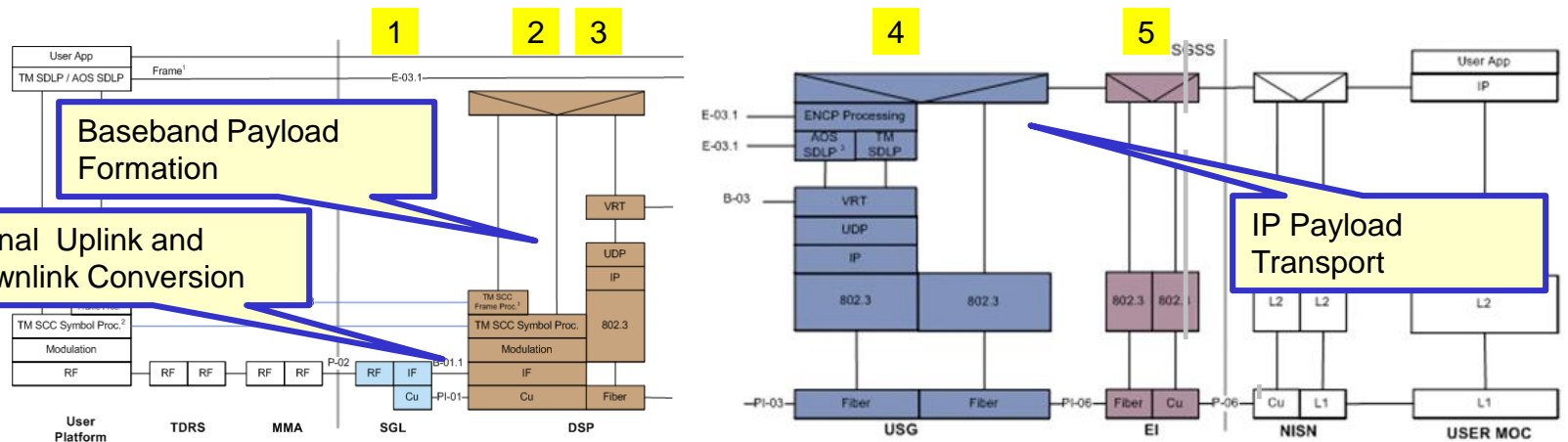


UDC performs protocol translations needed to connect DSP and MOC



Baseband Payload Formation

Signal Uplink and Downlink Conversion



SGSS Adds IP MOC Capabilities that Simplify and Improve MOC Access.

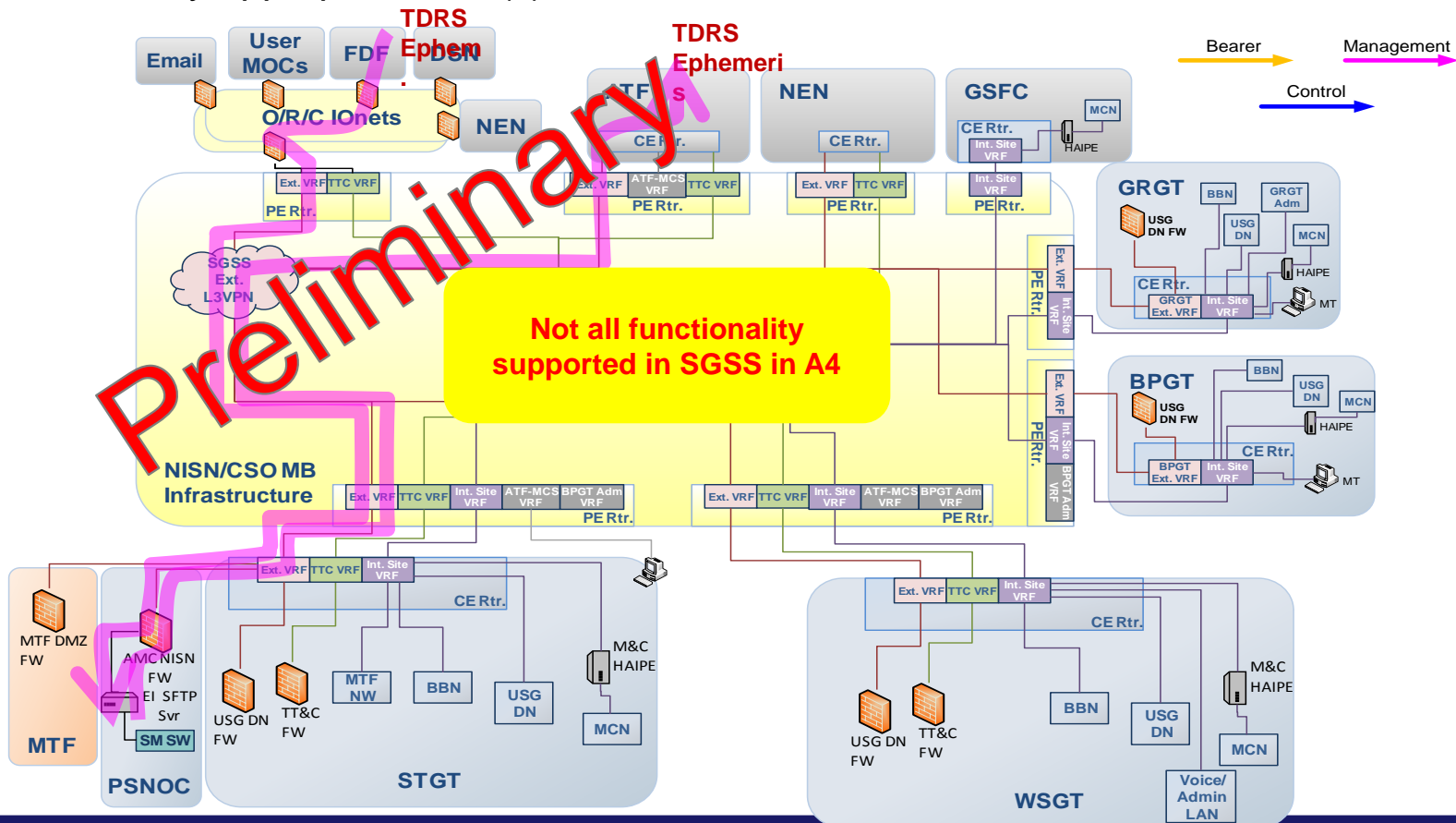


Backup

(For Early Testing)

• FDF Example

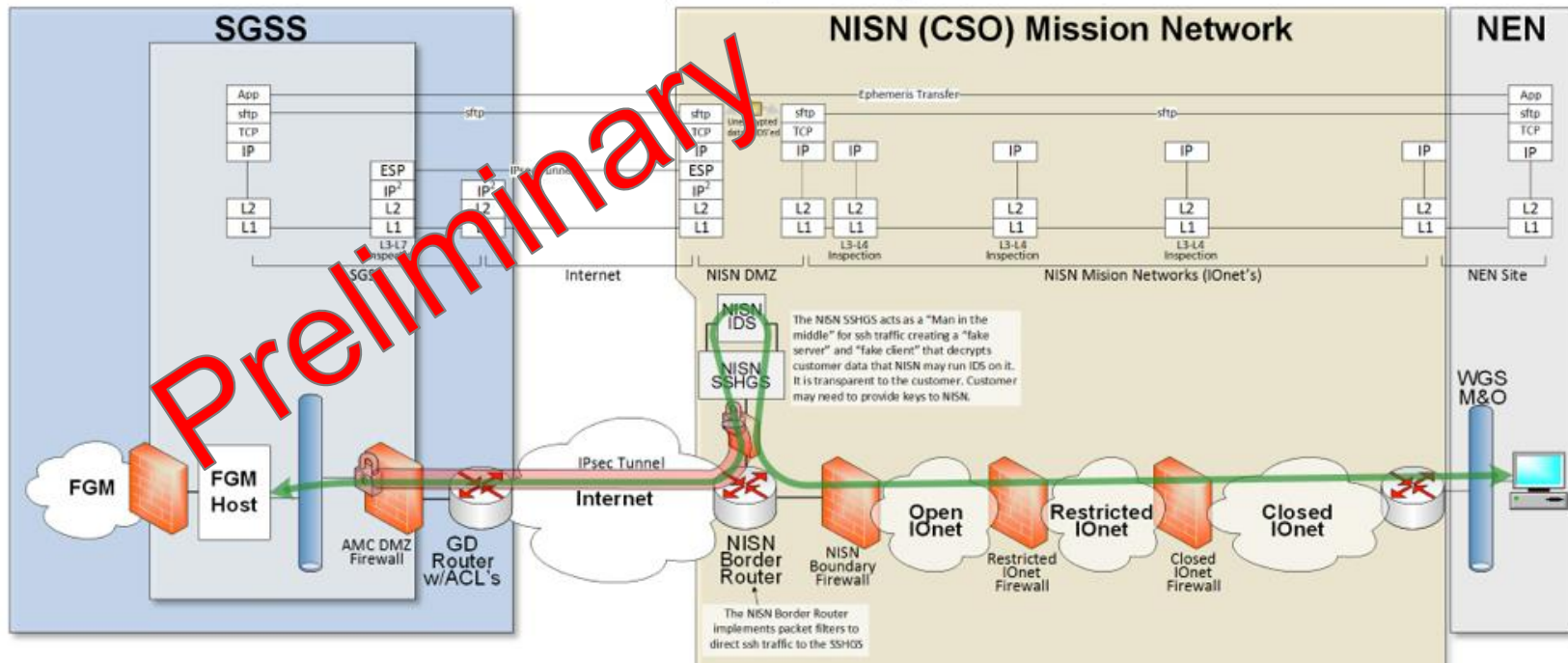
- GD re-using diagrams from other test activities. Diagrams + description will identify appropriate flow(s)



Sample Data (NASA Data Flow)

- NEN

SFTP from SGSS FGM to NEN
(TDRS Ephemeris)





Sample Data (Routing Information)



- Subset of FDF, NEN, DSN
- Used to develop FW rules

ID	Service Name or Type FW/RN	Label	Endpoint	SGSS SIAT ID / Alias-ID	Port	Remote Endpoint	SNAPe ID(s)	Port	QoS Prio	Transport Protocol	Initiates Link	Direction	VRB
E-01.1-FDF-01	IRV, Maneuver Messages / Ack	E-01.1	SM	test-45b00010002-dmstr-http-pss-vs	443	FDF	FDF-Stewart	(ephemeral)	AF31	HTTPS	FDF-Stewart and SGSS	bi-directional	Ext
E-01.1-FDF-02	TDRS Ephemeris	E-01.1	SM	test-45b00010002-dmstr-http-pss-vs	22	FDF	FDF-Stewart	(ephemeral)	DF	SFTP	FDF-Stewart and SGSS	bi-directional	Ext
E-07.2-NEN-01	TDM (UTDF)	E-07.2	LCTM (via E1 SFTP)	test-45b00010002-dmstr-http-pss-vs	20	NEN	NEN-WGS-001	20	N/A - To SGSS Only	FTP	NEN	Return	Ext
E-07.2-NEN-02	TDM (UTDF)	E-07.2	LCTM (via E1 SFTP)	test-45b00010002-dmstr-http-pss-vs	22	NEN	NEN-WGS-001	22	N/A - To SGSS Only	SFTP	NEN	Return	Ext
E-07.3-NEN-01	TDRS Ephemeris	E-07.3	SM	test28286-amclinux	(ephemeral)	NEN	NEN-WGS-001	20	DF	FTP (Manual)	SM	Return	Ext
E-07.3-NEN-02	TDRS Ephemeris	E-07.3	SM	test28286-amclinux	(ephemeral)	NEN	NEN-WGS-001	22	DF	SFTP (Manual)	SM	Return	Ext
E-10.2-DSN	TDM (TRF-2-34 Format)	E-10.2	LCTM (via E1 SFTP)	test-45b00010002-dmstr-http-pss-vs	22	DSN	DSN-Subnet01	22	N/A - To SGSS Only	SFTP	DSN-Subnet01	Return	Ext
E-10.3-DSN	TDRS Ephemeris (SPICE, SPK Transfer File Format, Manual Interface)	E-10.3 (Manual Interface)	SM	test28286-amclinux	(ephemeral)	DSN	DSN-Subnet01	22	DF	TCP	SM	Return	Ext